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ONE of the matters which we hope will engage the attention of the Convention of the American Institute of Architects is the provision of better and cheaper facilities for the conveyance of drawings by mail. At present, by a ruling of the Postmaster-General, drawings and tracings must pay letter postage, and where drawings are sent in pasteboard cylinders, or on wooden rolls, as is absolutely necessary to preserve them from the rough handling of the letter-carriers in cities, the cost of forwarding them by mail, although only one-half of what it was last year, is still very considerable, especially as compared with that of sending parcels of merchandise or printed matter; and architects are in consequence usually obliged to entrust their plans to the express companies, which, in country towns, are apt to be slow and uncertain in delivery. Even where an architect, for the sake of having his drawings transmitted through the most direct and recognized channel, goes to the expense of sending them by mail, he is, under the present system, by no means sure that they will arrive safely, and he has no redress against the Government in case of their loss or destruction. Most of us have had repeated experience of the loss of plans in the mails, and we remember one occurrence, more annoying, if possible, than the total loss of such property, where a city letter-carrier, to save himself the trouble of taking upstairs a valuable plan, which, unfortunately, had not been rolled on a cylinder, deliberately crumpled it up and pounded it until he could force it through a half-inch slit into a little letter-box in the hall-way of the building where he was to deliver it, and there it was discovered, some weeks later, after a great deal of time had been spent in trying to find what had become of it. Our post-office system is none too good, in any case, but we rarely hear of losses of merchant's samples, or other things of the kind, which pay for transportation only a small fraction of the tax levied on architects' drawings, and so long as architects pay exorbitant rates for such service, they are certainly entitled to demand that it should be done with decent care and despatch. The fact is that in the whole matter of transmission of parcels our post-office is at least twenty years behind that of any other civilized country. In England, France or Germany it is now as common to take a box or parcel to the post-office for forwarding as it is with us to mail a letter. Anything, not dangerous to other property carried with it, is accepted, prepaid by stamps at what seems to us an absurdly low rate, and sent by the next mail, and delivered to the consignee. There is a limit to the size of the parcels received, but in England, anything can be sent, we believe, which does not exceed seventy pounds in weight, or which does not measure, by adding the length to the girth, more than six feet. As these limitations admit a trunk of tolerable size, nearly all the transportation for private individuals which with us is done by the express companies, inconveniently and expensively, is there carried on by mail, and the service is so efficient and profitable, even at the low rates charged, that the various European countries are at this moment actively engaged in arranging for the extension of the "parcel post" to include service from one country to another. Here, as each nation has its own custom-house regulations, it is necessary to provide for examination at the frontier, and for the collection of the duties, but this has been successfully arranged, and the international parcel post is already in operation between England and Belgium, and will, according to the official announcement made last summer, be very soon extended to Germany and Holland, if it has not been already established. Between England and her colonies packages of merchandise have been transmitted by mail for some months, at rates which must make Americans who do not own stock in express companies rather envious. The last parcel which came to us across the ocean was a box, about fourteen inches cube, containing some books, and the bill for transportation from Liverpool was about five dollars. The same parcel, if we understood correctly the tariff of rates of the Colonial parcel post, which we saw in various places in England, would be carried from any post-office in England to any post-office in New Zealand, and delivered to the consignee, for thirty cents. Now, New Zealand is exactly on the opposite side of the earth from London, and the distance, by the shortest mail route, is about fourteen thousand miles, and if the English mail-steamers are glad to carry such a box fourteen thousand miles for thirty cents, it would seem as if a charge of five dollars for conveying a similar box, in the same steamer, less than one-fourth of the distance, must allow, to say the least, a considerable margin of profit. In a less degree the same discrepancy in cost between having a thing done on a great scale for the public benefit, and on a small scale for private profit is to be observed in inland transportation, and it is quite time that the people in this country out of whose pockets comes the difference should have the benefit of such economies as are now in operation elsewhere. Although architects do not have to pay out a very large portion of their substance for the carriage of their plans, their express and postage bills generally amount to a very respectable sum by the end of each year, and as they have the advantage of being able to speak their minds through the deliberations of a highly-respected organization, representing all portions of the country, whatever they might say on the subject would be sure to command attention.

THE State of Maine has recently established a Board of Health, which, to judge from its first Annual Report, vies in zeal with any board of the kind in existence. When we say that among the subjects treated of in the first report are small-pox, vaccination, cholera, yellow fever, scarlet fever, diphtheria, contagion, typhoid fever and consumption, it will be seen that the Board does not propose to lose any of its fellow-citizens during the year through its want of faithfulness in providing preventive suggestions against disease, and it must feel a comfortable consciousness of having covered the ground of contagious maladies pretty thoroughly. In general, the essays on these and the other principal topics are necessarily similar to those which appear in other reports of the kind, but the Maine Board has, besides these, collected a great number of reports from medical correspondents all over the State, which are extremely interesting, and in many cases valuable. There are few better observers to be found anywhere than country physicians. Thanks to the laws regulating medical practice, and to the many excellent professional schools in this country, one is sure to find in every village at least one careful and experienced man, fortified by his scientific training against hasty theorizing or one-sided observations, sufficiently versed in modern sanitation to write intelligently on the subjects to which it relates, and intimate, as only a good physician can be, with the methods of life of those among whom he dwells. It would hardly be possible to imagine a better or more trustworthy source of information than the experience of these men, and the Maine Board of Health, in the long series of little reports which it gives, offers hardly more than a suggestion of the benefits which sanitary science is some time to derive from such sources.

MANY curious quotations might be made from the letters of the Maine doctors. According to their unanimous testimony, consumption of the lungs is the most prevalent serious disease in the State, and many of them seem to have devoted an unusual amount of time to the study of the circumstances under which it arises. Among these, most believe that inheritance is the principal predisposing cause, but next to this nearly all put bad ventilation and dampness. One physician believes that, next to hereditary influence, the breathing of vitiated air at night is the most potent cause of consumption. He acknowledges that "the bad air of school-houses may have something to do with causing it, but not one-tenth as much as that of close sleeping-rooms." Most of the others, however, are inclined to attribute worse effects to school-room air than to that of bed-rooms. Even one who says that "heredity is the principal cause" of consumption in his town, remarks in the next sentence that "the most serious troubles with the schools are poor ventilation of the buildings, and dampness of the soil under and around them," and many, with reason, as it would seem, ascribe rather to the damp, ill-aired and often filthy school-houses, in which children pass their days, at least the depression of the vital forces which provides easy victims for the inherited or communicated disease, which in most cases makes its attack either during the period of school life or soon afterward. It would take too much space to quote half the interesting observations made in these letters, and the almost unanimous testimony which they contain to the wretched condition of the Maine school-houses would be best left for the private consideration of the citizens of that State, so we will finish by mentioning only a curious case, in which two young girls came on the same day to consult a certain physician about what seemed to be pulmonary trouble. Both appeared to have the same symptoms, which were those of incipient consumption, and subsequent visits only confirmed the impression made by the first. The doctor, as it happened, was provided with a good microscope, and finally examined with this the matter expectorated by each patient. In one case the matter was found to be swarming with the rod-like bacilli, while in the other case they were altogether absent. On being urged to give his opinion in regard to his patients, the doctor predicted that the latter would recover, and in a few weeks the inflammation of the lungs had run its course, and the girl was as well as ever; while the other patient grew steadily worse, and died in a few months of consumption.

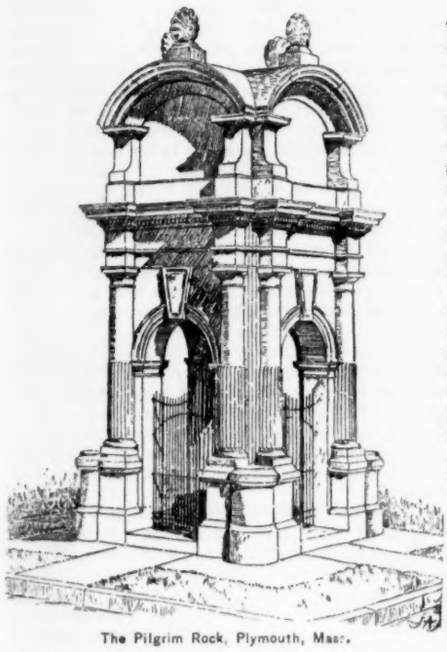
THE *Sanitary News*, with its customary energy, has been devoting its attention to the sanitary condition, or rather, prospects, of the Indiana State Capitol, and has been put in possession of some curious facts. Fortunately for their fellow-citizens, the people in Indiana who know something about building do not hesitate to inquire whether the huge structure for which they pay is being properly constructed, or to speak their minds if they find anything going wrong; and in the same way, at a meeting of county health officers, held some months ago, it was voted to investigate the plumbing and drainage of the building, which was suspected not to be quite what it should be, with the view of calling the attention of the Capitol Commissioners to anything that might be found objectionable. The investigation resulted in showing that a brick sewer, four feet in diameter, passed directly under the building; that it received on its way the various waste-pipes from the rooms above, all of which were, for a portion of their length, of glazed earthenware, imperfectly jointed, and buried under the cellar floor, while the remaining portion was of iron, jointed with hydraulic cement into the glazed pipes; that two of the soil-pipes were vented into brick flues, one of which had an opening into the attic; that no back-vents were provided to the traps of urinals or wash-stands; that there was no fresh-air inlet to any of the soil-pipes; and that the waste-pipes were too large, the urinals, for instance, being provided with four-inch outlets. The Commissioners were duly notified of these variations from the principles of house-drainage now current, but, instead of being grateful for the correction, they replied by asserting that "the plumbing had been arranged in accordance with the cardinal requirements of perfect house-drainage," and that they had employed a sanitary engineer "of national reputation," Mr. Levi R. Greene, of Boston, who had "made plans and specifications for plumbing in state-houses, hospitals, penal institutions and hotels in various parts of the country," and that this gentleman had pronounced the arrangement "altogether satisfactory and successful." Fortified by this opinion from their renowned expert, it is hardly necessary to say that the Commissioners paid no further attention to the investigating doctors, who were reduced to console themselves by describing their case to the Conference of State Boards of Health, which met at Toronto not long ago. Of course the Conference agreed entirely with the medical men, and commended their public spirit in endeavoring to have the State-House drainage made to conform with the present practice of intelligent engineers, but that, we suppose, will be the end of the matter, and the Indiana Capitol, that monument to a cheap architect, its ruined contractor, and an expert who, if the Commissioners represent him correctly, may at least be called old-fashioned, will finish, like so many others of the public buildings which discredit this rich and intelligent country, by quietly poisoning the people who pay for it, until, years hence, the public discontent makes it necessary to overhaul and reconstruct two-thirds of the plumbing, at immense inconvenience to the occupants of the building, and at a cost far exceeding that of the most perfect arrangement, put in at the proper time.

THE Grand Prize in Architecture at the French School of Fine Arts, has been awarded this year to M. Defrasse, pupil of M. André. The second place was awarded to M. Louvet and Ginain, and the third to M. Sortais, pupil of MM. Daumet and Giraud. It is worth remarking that M. André, whose pupils receive a large proportion of the recompenses in the School of Fine Arts, was the master of our own lamented Richardson, who enjoyed for about seven years his counsel and instruction. The subject for the prize design was a court-house, on a grand scale, the programme calling for a large central hall, the *Salle des Pas Perdus* of the French and Belgian court-houses, around which were to be grouped four small court-rooms, and a large public hall, for the announcement of decisions of special interest, while a hundred or more offices and consultation-rooms were to be accommodated in specified portions of the building, and a storehouse for records was to be designed in close connection with it. M. Rivoalen, who contributes to *La Semaine des Constructeurs* an interesting review of the prize works, compliments highly several of them, dwelling particularly upon the plans, which always seem to a French architect the most important portion of a design.

THE *Deutsche Bauzeitung* describes an absurdly simple piece of machinery, which, for all its simplicity, might often be made of great use, especially on those occasions when ingenuity is required to make the most out of ordinary materials. In this case the object to be attained is the dragging of a heavy weight up an incline, and the materials necessary consist of one long stick, one short one, one long rope, and one short one, and a handspike or bar of any sort. The apparatus is put together by sharpening the long stick, and thrusting it two or three feet deep into the ground, somewhere near the upper part of the hill. It is best to incline the pole away from the object to be hoisted. The short rope is then fixed at one end, by a loop, to the top of the pole, and at the other end to the short stick, which is driven into the ground on the side of the long pole opposite to the direction of the object to be dragged up the hill. One end of the long rope is finally turned once or twice around the pole, near the ground, and knotted over the handspike, and the other end is carried down the hill and attached to the load to be hoisted. If the top and bottom of the pole have been previously well rounded, it can readily be turned by the handspike, winding up the rope, and pulling the load up the hill. Almost any amount of power can be obtained by lengthening the handspike, and if the machine should give way by the pole being dragged out of the ground, it is the work of a few minutes to set it again in another place. It is hardly likely that such a rude device would supersede entirely the windlass or capstan, but for such purposes as helping a tired horse up a hill, or pulling an overturned vehicle out of a ditch, where nothing but improvised machinery can be had, it is admirably adapted.

AS the building-season for the current year has practically closed, so far as the beginning of new structures is concerned, we can accommodate in our Saturday's issue the most important of the building items we usually publish, and hence the publication of the mid-week number will, for the present, be suspended.

ARCHITECT, BUILDER AND OWNER BEFORE THE LAW.—I.



The Pilgrim Rock, Plymouth, Mass.

THERE is an old proverb, that "he who undertakes to be his own lawyer has a fool for his client"; and if one who essays to be his own architect usually purchases at a very high price a very imperfect knowledge of some portion of the art of building, the man who imagines that by reading a few law-books he will be enabled to get the better of his less instructed fellow-citizens is likely to have his illusion removed still more suddenly and unceremoniously. Nevertheless, as by knowing something of the art of construction persons of intelligence are led to greater respect for those who devote their lives to the study and practice of that art, and, by understanding their counsels better, derive greater benefit from their services, so may a layman, by knowing something of the legal rights and responsibilities which belong to his position, be enabled to avoid the misunderstandings which lie at the bottom of nearly all business disputes, at the same time that he is forewarned against the errors by which he will incur the penalties of neglect of duty, and fortified, if necessary, in his endeavors to resist intentional fraud, or to enforce just claims. Among all the business relations which men enter into, there are none, perhaps, more complex than those which are involved in the construction of a building, by the coöperation of a multitude of contractors, journeymen, and dealers in materials, under the supervision of an architect, for the owner of the land on which the building is erected, who is also the employer of the architect; and it speaks more for the general honesty and good faith with which such operations are carried on than for the prudence of the persons who engage in them that there are hardly any two classes of men whose legal status, in regard to other people, is so undefined as that of architects and builders.

Of these, the architects seem to have had the least occasion to appeal to the law in defence of their rights. Perhaps a million building contracts, taking the world over, are carried into execution every year, and it would be strange if, out of all these, disputes enough should not arise to make the list of building cases decided in the courts a tolerably long one; but architects are not only less extensively employed than builders, but appear to be even more peacefully inclined, and cases to which architects are parties are rare. For this reason, much that relates to the legal position of architects must, for want of judicial decisions bearing precisely on the point, be inferred, or at least illustrated, by the comparison of cases belonging to the history of somewhat similar professions, yet, scanty as is the material for fixing his exact relations to other persons, the architect is so important a factor in building contracts carried out under his care that it is best to begin by defining those relations as carefully as circumstances will allow, taking up first the mutual duties and obligations of the architect and his client, the owner of the future building, and afterwards those which exist, or may, under certain conditions arise, between the architect and the builder.

An architect may be employed in two different ways to render professional services. He may be hired, at a given salary, payable by the day, or week, or month, or year, to perform certain duties, or he may be simply engaged to do a certain piece of work, either for a fixed sum, expressed or implied, or, as is more usual, for a small percentage on the cost of the construction carried out under his charge. His engagement to render service in either of these ways forms the subject of a contract between him and his employer, and as it is upon this contract that he must rely for obtaining his compensation, he cannot be too careful to have the terms of the agreement clearly understood by both parties. In consideration of the liability of the human memory to error, and to prevent innocent persons from being imposed upon by people professing to have claims against them, founded on long-forgotten conversations, the laws of all civilized countries provide that no court shall recognize, or assist in enforcing, any agreement for services which are not to be performed within one year from the time of the making of the agreement, unless the agreement, or some memorandum of it, shall be in writing, signed by "the party to be charged," that is, by the one from whom payment is sought. This rule is strictly applied in the case of hiring salaried employés, and when a man is, let us say, appointed city architect, or engaged as assistant engineer, "for one year from the first of next month," or "for twelve months from the beginning of the next financial year," he may be dismissed, without fault on his part, at any time before the expiration of that period, and will be without redress, unless he can show a contract, or a memorandum of his appointment, or some other unmistakable evidence of the terms of the understanding between him and his employer, expressed in writing, and signed, in some manner satisfactory to the court, either by the employer or by an authorized representative. There are many instances of the application of this rule, which is one of the sections of the Statute of Frauds, and appears, in nearly the same words, in the statute-books of all our States, as well as in those of other countries; but one or two illustrations will be enough. In a certain case a land-owner, on the twentieth of July, hired a steward, agreeing verbally to employ him for a year, but allowing him a few days to make arrangements for his change of place. The steward entered upon his duties on the twenty-fourth of July, and afterwards found occasion to call upon his master to perform his part of the agreement, but failed, the court holding that the contract of hiring was void under the Statute of Frauds, for want of writing. So where a journeyman wagon-builder[1] verbally agreed to work two years for a certain firm, for which he was to receive one hundred dollars, or fifty dollars a year, and, after working for them six months, became tired of his bargain, and left them, it was held, when his employers sued him for breach of contract, that the agreement, not being in writing, was void under the Statute of Frauds. It is worth noticing, however, that it seems to have been the condition that the agreement was to be for two years, for one hundred dollars for the term, which brought it unmistakably within the statute, and if the contract had been, let us say, for services for two years at a dollar a week, there appears to be some doubt whether it might not have been enforced, although not attested by any written paper. In the discussion of the same case before the Supreme Court of the State of New York, reference was made to another,[2] in which the defendant had verbally promised to pay the plaintiff, a minister, a salary of two dollars a year for his services. The services were duly rendered, and the defendant, probably thinking that the minister could not bear the loss of interest on his salary so well as himself, paid him a dollar every six months, instead of waiting until the end of the year before paying him his two dollars. This went on for several years, until differences arose between the minister and the capitalist, and the former had to bring suit to have the contract fulfiled by the other party. His claim was resisted on the ground that the agreement, being for services not to be performed within a year, was void under the Statute of Frauds. The court, however, decided that in the absence of any written contract or memorandum, the fact that the minister had got his dollar every six months was evidence, the value of which might be estimated by a jury, going to show that the real intention of the parties was to have the minister do six months' work at a time, and get his pay for it as soon as he had earned it, and if the jury concluded that this was the actual intention, the Statute of Frauds was inapplicable to the contract and it might be enforced. Fortunately for the minister the jury did come to this conclusion, and he recovered the amount of his claim. It has been decided in Connecticut, also, where an engagement was made with a man to work in a

[1] Drummond *vs.* Burrell, 15 Wend., 307.
[2] Moore *vs.* Fox, 10 Johns. R., 244.

factory a year, at a dollar a day, and the agreement was afterwards repudiated, that as there was no time agreed upon for the man to begin his work, he might have begun it immediately, and as the Statute of Frauds only refers to contracts which in their nature cannot be carried out within a year, it did not apply here.

Although the courts do not assent to any evasion of the law, they will accept a written and signed memorandum, made subsequently to the verbal agreement, and intended to refer to it, as a good substitute for it, and this written memorandum may be made at any time before the contract is completed. A good example of this is to be found in a case where a verbal contract was made for the sale of some coal,[1] which was afterwards repudiated by the seller, and a suit for damages was contested on the ground that the contract was void by the Statute of Frauds. It was proved that some time after the verbal agreement of sale was made, the purchaser wrote to the agent of the defendants, asking for "a statement of our coal engagement," and received an answer, recounting the quantities and prices that had been agreed upon. This reply was signed by the agent, and the court held that it was a sufficient memorandum, and that the signature was sufficient to make the contract binding.

Where there is no attempt at fraud or extortion, the courts are disposed to interpret the Statute of Frauds as favorably as possible for the party who would suffer by its strict enforcement. Even in the matter of the signature which the statute requires, a very liberal interpretation is allowed. In one case, where a contract had been written in the common form, reciting that "I, A. B." agree to some matter, but had not been signed in the usual place, on the line left blank for the purpose at the bottom of the page, the enforcement of the contract was resisted on the ground that it was not signed, and was therefore void; but the court, finding that the agreement was filled out in the defendant's handwriting, held that his insertion of his own name, although not in the usual place for a signature, was a sufficient signing to satisfy the statute, and that he could not escape from his agreement.

THE PARIS SCHOOL OF FINE ARTS. — PAST AND PRESENT.[2]

THE INSTITUTION.

Original Sketch by Pils for a panel over the Grand Staircase of the Paris Opera-House.

WHEN Louis XIV was weeping at the death-bedside of his prime Minister Mazarin, this last told him he would not be much loss, as Colbert remained behind. This compliment was not exaggerated, as it is due to this great man and public benefactor that France to-day owes its present National Institution of the Fine Arts.

It was founded by Louis XIV in 1648, and in 1671 he added an Academy of Architecture; after a century and a quarter of existence, in 1793, the year of the Revolution, the two were suppressed, but two years later, 1795, the schools of painting, sculpture and architecture were reunited in one and given the name of School of Fine Arts, and made independent of the Academies, known as the Institute of France; and in 1819, Louis XVIII developed a system of instruction which was not interfered with until 1863, under the second empire. It was divided into two sections: painting and sculpture, and architecture. In the first department were twelve professors — seven painters and five sculptors — who came daily to the school, to explain the human figure as drawn from the antique and living model, while three of these professors had special courses in anatomy, perspective and history. In the second division of architecture the tasks were divided between four professional architects, one for theory, one for practice, one for the history of the art, and one for mathematics: while they were assisted in their decisions of the competitions of emulation by a commission of twenty honorary members selected among the most distinguished architects of the time, by the assembled professors of the school. There were a director, secretary, and five members for the actual administration, all selected yearly, among the Council. By this arrangement the school was endowed, by the decree of 1819, with great prerogatives, and controlled itself by an elected council, which taught as it saw best, without ministerial interference; but in 1863 the Imperial Government completely changed this organization, and relegated to itself the control of this most important branch of public instruction. Its argument was that the school being a national institution, the Minister of Fine Arts was held responsible for it to the Emperor, and it was not just if he were not allowed to penetrate in the councils of the school, and there impress some of his ideas for its existence, and, while admitting that a body of *savants* should be recruited among themselves by election, yet it held the School of Fine Arts was not a learned body, but a service of the State, whose management should enter into the attributions of a ministerial department, regulated and administered by the same rules and principles; while it further contended that the system of self-elective professors had, as an inevitable result, the perpetuation of doctrines and theories more or less absolute, which jarred with the principles of the Empire, which pretended to have no system or fixed and prejudiced ideas, but judged all without prevention, only too happy to encourage originality. Of course their arguments were entirely justified by every theory of Imperialism. No painting had before been taught, nor engraving on metal or gems; while in the architectural department, the classical traditions and instruction that prevailed and were insisted upon prevented any fresh and vigorous individuality from receiving encouragement or recognition.

So on the 13th of November, 1863, the Emperor signed a decree re-organizing the School of Fine Arts, in which the administration was confined to a director, named for five years, who was chief over all the subordinates, and the interpreter of the wishes and decisions of the Minister, and all his administrative regulations. The service consisted of a secretary, a treasurer, a librarian, and a keeper of the casts; the corps of instructors included seven lecturers and eleven heads of studios; while there was instituted a superior council composed of the superintendent of the fine arts, the director of the administration, two painters, two sculptors, two architects, one engraver, and five members appointed by the Minister.

A list of the studies is pertinent to the subject, as well as to give an idea of the importance of the school as a national institution of learning. For the painters, sculptors and engravers, there were the history of art, anatomy, perspective, costumes, ornament and æsthetics, and for the architects some of the above, as well as architectural history, architectural theory, building, legislation, physics, chemistry, universal history, literature, archæology, decorative composition, construction, both theoretical and practical, plain and descriptive geometry, stereotomy, and mathematics from the first principles of arithmetic to the highest branch of mechanics.

This so radical reform of the old system of artistic instruction aroused violent recriminations. The Institute of France saw with great displeasure escape from it attributes that gave it a *rôle* and considerable importance. Ingres bitterly contested the arguments of the Imperial Government, believing it tended to destroy the former good organization of the school, that it attacked rights acquired by time and respected by all, and a manner of instruction based on classical traditions, to give in return one only founded on fantasy and adventure, with incompetent judges falsely directing the studies. The newspapers were filled for weeks with protestations, though hundreds of professional men sided with the Emperor, and recognized that the liberal principles on which were based the terms of the decree, opened to young talent a new horizon, and placed the instruction within the requirements of the period and the progressive spirit of the century. As by this decree the Institute of France lost absolute control of the official instruction of art, and placed it in the hands of the Imperial Government, the forty "immortals" were not slow in announcing their opinion of the sagacity of the act, though since, they have been willing to concede that this transfer of authority was for the best interests of France and art.

THE PRIZES.

As there are over one thousand students, the school has instituted, for their encouragement and emulation, a large number of medals, while endowments have been made from time to time, until now there are twenty-six cash prizes given by the school and Institute, amounting to 32,145 francs, but the highest gift in the hands of the Government is the Grand Prize of Rome. To not mention it would be an oversight, as it is entirely conducted at the school, though the subject is given and the award made by the Institute of France. The hospitality of the school, which was offered to foreigners for the first time under Louis Philippe, was extended under the Empire, to competition for all the medals and cash prizes except this prize of Rome.

In 1666 a lull in the storm of rivalry that existed among the artists in the French Academy and its disagreements outside, was obtained chiefly by the efforts of Colbert, who asked the painters to assist him in his endeavors to raise the character of the fine arts, and no man had a better right to a respectful hearing than the Minister, who at that moment was urging the king to purchase a palace at Rome, for the reception and instruction of young prizemen, to make permanent that intercourse with Italy, which had already been frequent though desultory, for Louis XIV had, at his own cost, sent painters, sculptors and architects to Rome, for the purposes of study and comparative observation, and he now determined to recompense,

[1] Williams *vs.* Bacon, 2 Gray, 391.

[2] A paper read before the Gotham Art Students, New York, by Mr. Henry O. Avery, architect, graduate of the Paris School of Fine Arts, and Member of the New York Chapter of the American Institute of Architects.

each year, those students who carried off the royal prizes, by the establishment in Rome itself of a branch academy, in which twelve artists could be lodged and boarded at the king's cost, each for a term of five years. Such an extension of the functions of the Academy in Paris conduced to greater harmony in the conditions of its affairs and greater emulation among its members than had ever existed before. The rise and progress of the Academy at Rome has been unchecked for two centuries.

This travelling scholarship consists of a five years' residence in Rome, though the student is expected during the second year to visit the principal cities of Italy, and even go to Greece, where there is also an Academy at Athens. The list of successful students is a long one, and to give it would be but to repeat many of the greatest names that have figured in the history of European art. In the estimate of their attainments and developments, the list suggests the obvious result which systematic training in a particular line must have produced, not only on the art of France, but on the nation at large.

THE PROFESSORS.

Ingres in the first half of the century, and the celebrated and world-renowned trio, Cabanel, Gérôme and Pils, under the second empire and republic, have shaped the art of France and made its progress sure and unchangeable. Classicism culminated in Ingres, and the present generation of professors have in a great measure respected its traditions, while consecrating their time to the services of art and their country.

Ingres, born in the last part of the past century, was a pupil of David, and received under him the Grand Prize of Rome, and became the champion of his classical teachings, so much so, he was accused of searching the ideal in the past and not in the present century, but the verdict of his contemporaries and admirers was that he was so great he was eternal, and not of his time and period; he is considered the greatest draughtsman of his century; his drawings can be compared to the finest period of Italian art — they are the maximum of science in art, energetic without ostentation, precise without minutiæ, full of masculine dignity without pretension — in a word, perfection. He produced a tremendous work, by incessant labor, as he considered that incessant genius depended on the will. He was short, stout, with strong features, low forehead, broad nose, severe mouth, with a jaw of iron, and black, snappy eyes. Everything in this extraordinary man was robust, and prepared him to enter the arena of life and for sixty years meet the attacks of the colorists, who disdained anatomical truth and drawing. No man had more enemies, but he survived them all and left a work that will never perish.

Cabanel was born in 1823, and received the Grand Prize of Rome at the age of twenty-two. He had already obtained, two years before, a gold medal, which was but the forerunner of a long series of successes and honors, that terminated in his election to the Institute of France, the highest gift of his country. Like many other famous men, he was a pupil of Picot, who infused in all his pupils such sound and profound qualities. Not satisfied with his five years of study of the old masters at Rome, he afterwards went to Florence to study Ghirlandajo, and there absorbed what was best in him, copying him servilely, attempting to discover the source and truth of his realism and the spirit of the life of his time. He worked incessantly, with the self-imposed task of assuming rank among the greatest, and he arrived there by an ardent will, seconded by eminent dispositions. He is an artist of very rare talent, while personally he is elegant, handsome and distinguished, which accounts for the title of "aristocratic brush," which was given him by the critics. He became a professor, with the new organization of the school, it being the year he succeeded Horace Vernet in the French Academy. His many historical canvases will remain the finest pages in the book of modern art.

Gérôme was born the year after Cabanel, but, unlike him, he never had the Grand Prize in Rome, though he followed him to Italy, where he continued his studies under Paul Delaroche. He had as many other distinctions in life conferred on him as his colleague, and was also made a member of the Institute, and Commander of the Legion of Honor, a grade of that decoration that but six painters have ever had. He had a great success with his first picture, when only twenty-three. It is owned by the Government, who placed it in the Museum of the Luxembourg. He is a man of great talent and resources, well read, and a learned archæologist, and as such always selects subjects that require research and great qualities of study and observation. He has travelled across southern Europe, and into lower and upper Egypt; his reputation is universal, and no collection of renown is without his work; he shows the fidelity of a *savant*, with the intuitions of a poet; his classical pictures, though somewhat labored, evoke the souvenir of ancient Greece and Rome, and if his pictures are always well ordinated and clean, yet he is fine and distinguished, pure and good, laborious but exquisite, and never in sympathy with those of his countrymen who have given in to the caprices of the time to paint from imagination. In person Gérôme has a bony face, dead eyes, large forehead, once black but now grizzly hair, yellow complexion. He walks erect and stiff, is irreproachable in his dress, with his coat tightly buttoned, his cravat geometrically tied, his moustache trimmed and straight, all of which helps to explain the man's temperament as revealed in his work.

Pils was born in 1815, and took the Grand Prize of Rome at the same age as did Cabanel, and immediately after his return to France he made a brilliant début at the Salon. His medals were numerous, and other successes continued, until, in 1868, when he succeeded his own master, Picot, at the Institute. His first really great picture was "Rouget de l'Isle singing the Marsellaise," and popularized by the well-known engraving. This was a patriotic inspiration, painted during the Revolution of 1848, and led to the military subjects that made his reputation and to which he owes the celebrity of his name. His artistic career culminated in the "Battle of Alma," which will always keep his name illustrious. Pils in later life was weak and sickly, which obliged him to abandon all outside work while he was doing the four enormous panels for the Opéra of Paris. He worked on them with his habitual energy, against the protests of his friends, but succumbed just as he signed them. He virtually gave his soul, with his ebbing life, to this last great artistic effort. As a military painter, though, he will figure in history. He excelled in painting the dead and dying, the wounded and convalescent, while a sincere pity and profound emotion animated his canvases and gave them the sentiment and poetry of military life; he made you hate war but love the soldiers, through their sufferings and deprivations.

And last, though not by any means the least, I may be pardoned if I speak of my own master, Jules André, who has figured prominently in the architectural department for one quarter of a century, which began with the new organization of the third Napoleon; his studio has always been the most popular, and it obtains regularly two-thirds of the medals and other prizes, and sends more men to Rome than any other; he is a man with the purest taste and the sentiment of classic art, and has contributed to maintain this art in the route it has followed for more than a century. Though a thoughtful and learned archæologist, his knowledge does not stifle his inspirations, for he always brings out the grandeur of the style and its monumental character, while he has communicated his enthusiasm to an entire generation; he received the Grand Prize of Rome in 1848, the year of the Revolution, and at once undertook to bring out the physiognomy of the Roman monuments and the æsthetic character that belongs to each; while also studying the moulded marbles, gilded by the sun, the picturesque effects, the sombre richness of the Etruscan tombs, the lovely coloring of Pompeii, the dignity of Pæstum and the beauty of the Sicilian temples. This group of restaurations was exhibited at the Universal Exhibition of 1885, and delighted architects, artists and connoisseurs so much the government was asked to publish them, which resulted in a publication that represents heroic efforts, fatiguing journeys for distant researches in Greece, of discoveries impregnated with talent and intelligent discipline in the investigations of the principles and traditions of antiquity. His latest and greatest work, the Museum of Natural History in Paris, carried him to a seat among the forty "immortals," and gave him the grade of Officer of the Legion of Honor.

THE BUILDINGS.

By a decree of the Convention, the convent of the Little Augustins, which was founded by Margaret of Valois, first wife of Henry IV, was converted into a museum of French monuments. The archæologist Alexander Lenoir, who had made the suggestion first, was made director, and opened it September 1, 1795, with a zeal and perseverance beyond all praise. He succeeded in uniting more than five hundred monuments of ancient France, including architectural fragments, statues, bas-reliefs, tombs, divers tablets, etc., that were chronologically arranged in ten halls, built themselves with the débris of other and similar monuments; he did even more, for he compiled with a sagacity that is rare, the descriptive catalogue of this precious collection, a book so valuable to consult on any subject that relates to the ancient history of France, that it is considered an authority with archæologists. The government of the Restoration destroyed the Museum of French Monuments, and returned to the churches and convents the majority of the objects which had been taken from them during the turmoils of the Revolution. To utilize this vast site thus made vacant, it was decided to instal there the school of Fine Arts, and a well-known architect of his time was selected to adapt the locality to its new destination, but he thought of nothing better than to demolish all the buildings of the old convent, except the chapel, and erect in their place and gardens the edifices that to-day are called by the somewhat ambitious name of Palace of the Fine Arts. The plan is very irregular, and consists of a series of buildings and courts, the principal one of which is separated from the street by a handsome railing, with stone posts, holding the busts of Poussin, the painter, and Puget, the sculptor, whom the French consider the greatest masters of their respective art. The sides of the court are covered with blind arches filled in with paintings or enamelled lava, after Raphael, while at the end is the principal front of the Château d'Anet, which serves now as an entrance to the old chapel, out of which proceeds a long corridor that leads to the several amphitheatres, where lectures are given. On the fourth side of the principal court is the gateway of the Château of Cardinal of Amboise, and through it can be seen the principal front of the school, two hundred and fifty feet long; this is in the correct and elegant style that prevailed in the sixteenth century; it contains an enormous covered court in the centre, with rooms around and depending on it, for a collection of casts, the largest and finest in the world, representing the Greek, Roman and Mediæval ages, and called collectively the Gallery of Casts; on the second floor are the library, with several thousand volumes, the

Louis XIV room, with portraits of all the Academicians of his century, the Council-room, with portraits of the directors, the Model Hall, where is a remarkable collection of models of Egyptian, Greek and Roman art in cork, mostly entire buildings, the Gallery of Prizes, where can be seen all the grand prizes of Rome since 1721. On the side of the river, and facing the Louvre, are the vast Exhibition Rooms, used for the competitions of the school, the largest room of which, the Hall of Melpomene, is a splendid room rising to the roof, from which it is spaciously lighted. Here are the famous copies from the Vatican, and the penetration of the ceilings give the celebrated sibyls and prophets of Michael Angelo; the Sixtine Chapel is next to thi , and is so called because of the splendid copy of the Last Judgment, on canvas, the size of the original. The chapel contains casts of the Renaissance, among which are the tombs of the Medici, the Ghiberti Gates, and other famous pieces. The hall and chapel are poetically joined by the Pompeian Court of the Mulberry Tree, under the arches of which are fine old copies, from the antique, some having been made under Louis XIV, by his pensioners at Rome. The freize of the Parthenon is here very finely introduced in the walls on a background of dark reds; here, also, was placed the monument of Henri Regnault, who was killed during the war of 1870, and last, but not least, is the famous semi-circular room known as the Hémicycle.

THE HÉMICYCLE.

The Hémicycle is the title given to the composition which decorates the *semi-circular* wall of the amphitheatre of the school, which is set apart for the delivery of inaugural discourses and the distribution of the prizes awarded to the students.

The chairs of the professors occupy a semi-circular niche, which takes almost the diameter of the large hall, while the semi-circular benches for the students are in front; around and above them extends the wall already mentioned, which is well lighted from above.

In the year 1837 it was suggested to the government of Louis Philippe that this wall should be decorated with some appropriate subject, instead of being left bare. The idea was followed out by the Minister of the Interior, and the commission was given to Paul Delaroche. His first sketch which comprised only twenty-four figures was approved, and the contract signed for $15,000, the picture to be finished in one year. Inspired by a noble ambition to leave behind him a work that should connect his name honorably with those of the great men who had gone before him, and justify the choice of his country and the applause of Europe — as his was already a European fame — Delaroche, while adhering to his first conception, gradually enlarged it, till the twenty-four figures had extended to seventy-five, and, after nearly four years of incessant study, the magnificent composition was unveiled to the public. It received a large amount of admiration and applause, and was considered one of the greatest, if not the greatest, production of modern times; and it is proper to state that on its completion the artist absolutely refused any further remuneration than that which he at first stipulated for, a sum which scarcely repaid the cost of labor and material, while the thought and time were virtually munificently consecrated to art and to his country.

The space covered by the painting measures not less than fifty feet in length by fifteen in height. The figures in front are colossal; those further removed are life-size; the painting is in oil. All the personages are still; the animation is in the expression and attitude, without movement; the subject, as conceived by the painter, is the distribution of the prizes awarded to successful talent in the presence of an assemblage of the greatest artists of every age and country, from the era of Pericles down to that of Louis XIV. They are placed in a Temple of Fame, on the throne of which are seated Apelles, the painter, Ictinus, the architect of the Parthenon, and Phidias, the sculptor, who preside by right of their antique fame, below them four female figures that represent collectively the theory of art, and separately personify the four great influences which have developed into form in the fine arts, that is, Greek art, Roman art, Gothic or Mediæval art, and the Renaissance; while in the centre, beautiful and bold, is a half-kneeling female figure, representing the Genius of Fame distributing laurels.

This central feature of eight figures as compared to the rest of the composition is a sort of vision, combining the real and the ideal.

The architects are grouped together, as well as the sculptors and painters, these last being divided into draughtsmen, designers and colorists without any attempt at chronological order, as Delaroche considered that these men, assembled in friendly convocation, have already taken their place in the Temple of Immortality, where earthly distinctions of time and place are at an end.

THEORY OF INSTRUCTION.

In the departments of painting, sculpture, and engraving, no attempt was ever made to reduce the instruction to formula, the leaders of each generation knew that art eludes any attempt to analyze it, or fix its principles by logical deductions, and that the standard of truth should be fixed by the consent of persons of correct judgment and refined tastes, though the present training of the school can be said to be expressed in the art that culminated in the leadership of Ingres. In the architectural department until recent years the training was purely classic, though the Renaissance has now stamped its own peculiar forms upon all the work of the school, the classical traditions of the early teachers were adhered to, until the Second Empire allowed the men to give full scope to all the ability and originality they possessed. In this rapid progress towards truth and unity, were seen the advantages of the national school, as the men were equally well educated, and worked together in their professional life, while rapidly perfecting a new style of architecture of which the New Opera-House and the Trinity are the latest, and perhaps the most complete types; if there is to be a new style of architecture this school will produce it; the conditions that created the old styles are realized and appreciated, while being adapted to the requirements of our modern and advanced civilization.

Under the Second Empire enormous sums of money were spent in beautifying the capital and provincial cities; entire quarters were demolished, new boulevards cut through, streets widened and extended, elegant and costly residences replaced old ones torn down, hotels, houses, churches and public edifices were erected, all on a scale of magnificence hitherto unknown in the history of the world.

THE RESULTS OF THE WORLD'S CREATION.

Before the forming of the school the painters only walked in the paths opened for them by the Florentine and Roman masters. The Dutch and Flemish schools were enjoying great prestige, and though it had produced some great men, yet it taught art without thought, imitation without ideality or poetry, while encouraging a servile copying of nature with extraordinary minuteness of workmanship that lessened the artistic faculty, while the French at once saw and felt that art should be elevated by thought, poetry, philosophy and Christian sentiment, and the school created a species of art which was truly and conspicuously original.

As the three Louis were great patrons of ecclesiastical art, their dynasties developed the religious ideal, the Revolution created the philosophical ideal, which was followed under Louis Philippe by the Romanticists who fought against the large canvases of the First Empire and produced the Orientalists, from whom outgrew the Realists of our day. With all these struggles France has always possessed a true school, which produced a succession of great men, who have ever upheld its traditions, men who united nobleness and dignity of form to the most conscientious adherence to nature, who brought to the service of their realism a profound knowledge of coloring, a correctness of design and truth of expression, which won for them the highest positions in the hierarchy of art; they have created a school which is poetical in the lyric sense of the word, possessed with great religious feeling, a high appreciation of nature, and, above all, historical in the highest degree, endeavoring to record with pencil and brush, the ideas, manners, and events of the times in which it existed, and have, since its existence, created the most original, the most varied, and the most national school in the whole history of art.

THE ILLUSTRATIONS

Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

STAIRCASE IN THE HOUSE OF THE LATE HENRY W. LONGFELLOW, ESQ., CAMBRIDGE, MASS.

[Gelatine print issued only with the Imperial and Gelatine editions.]

THE ASTRAL APARTMENTS, GREENPOINT, N. Y. MESSRS. LAMB & RICH, ARCHITECTS, AND MR. E. L. ROBERTS, CONSULTING ARCHITECT, NEW YORK, N. Y.

SINCE the "Stewart Home for Working Women" was started in New York many years ago, attention has been repeatedly called to the great need of a good, comfortable home, not only for working women, but for a large class of people who want a home near their work, or business, in which they can live with comfort at a small cost. It has not been difficult to find such a place for those who could pay from $75 to $150 per month rent, but the difficulty has been to find a good home with plenty of light, pure air and pleasant surroundings at a rent of from $12 to $30 per month. The classes which it is desired to accommodate are: The widow who has lived in affluence but has been reduced in circumstances and feels that she must make a home for her children; for the shop-girl, who has to go early and stay late at her work, and for the clerk, or tradesman, who needs to save from his salary or small capital. There is also a large class whose circumstances, from one cause or another, require a comfortable home at a moderate rent. The number embraced in this class is much larger than would appear, perhaps, on first thought. Added to the above is the great body of first-class mechanics who have families, often cultured to a high degree and who can appreciate a home with cheerful surroundings. But how can it be had within easy reach of their business, where, within an hour's nooning, they can take their mid-day meal at home?

Mr. Charles Pratt, of Brooklyn, has, for a number of years, been endeavoring to practically supply this great want by the erection of a building or buildings which would be the best and most perfect possible solution of the working-man's home problem and to alleviate in some measure the suffering caused by a lack of proper home conveniences. In the solution of this problem, with all its difficulties, his

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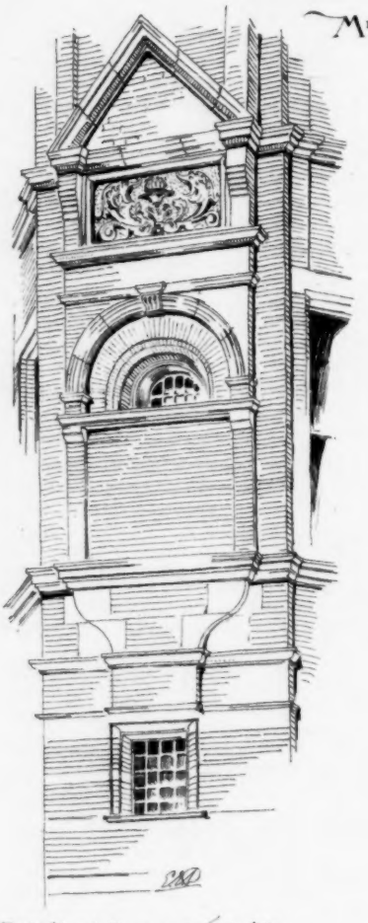
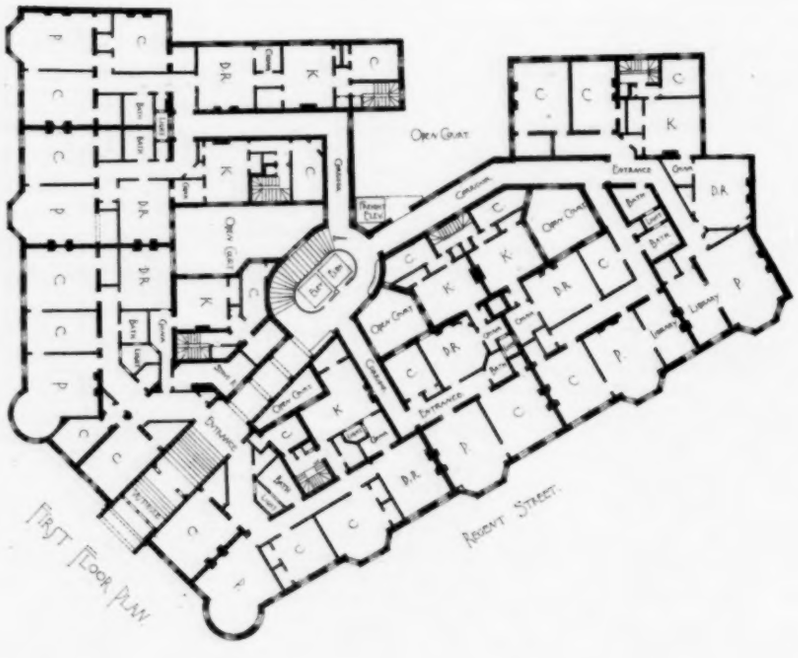
THE WARREN Suburban Apa

Mr Carl Fehmer. Archt



Detail of Bay on West side.

General View looki



Entrance

Sketches by E. Eldon Deane

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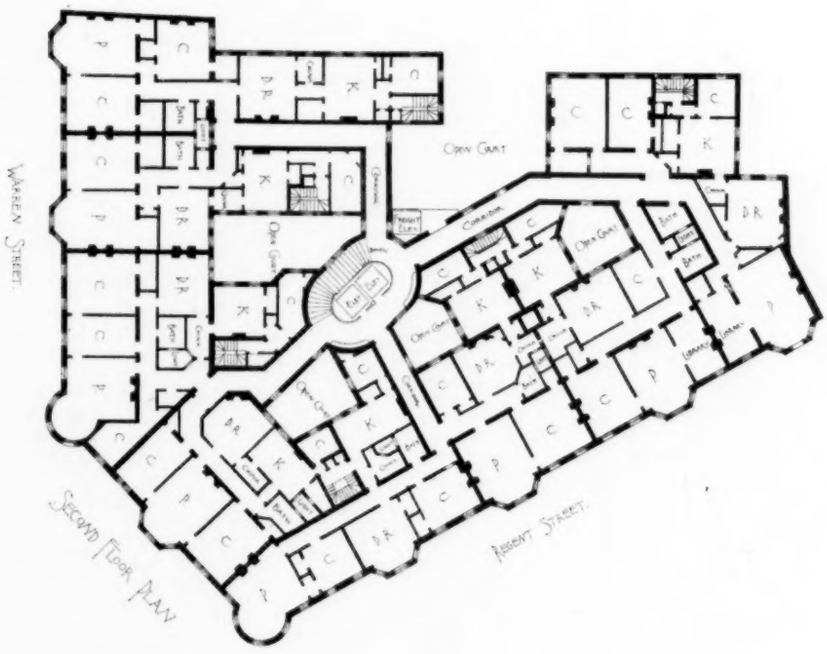
Urban Apartment House: WARREN ST: ROXBURY. BOSTON. MASS:

View looking up Warren St.

One of the Bays.



SECOND FLOOR PLAN

Heliotype Printing Co Boston

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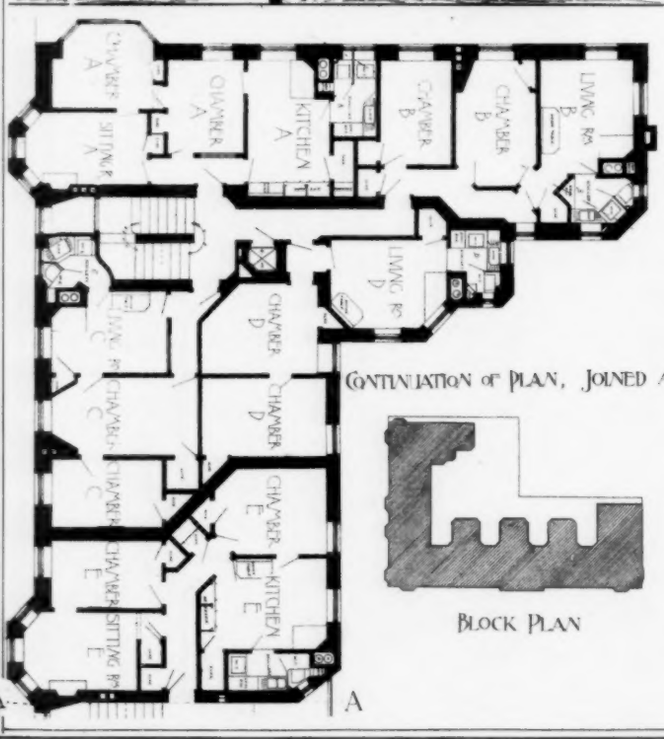
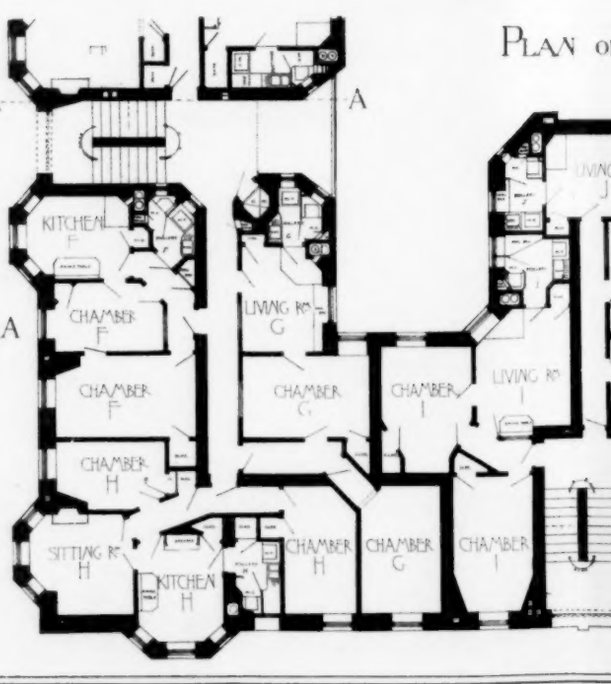
THE ASTRAL · Franklin · Java and India Streets · Greenpoint · New York

Lamb & Rich
Architects
265-267 B'Way N.Y.



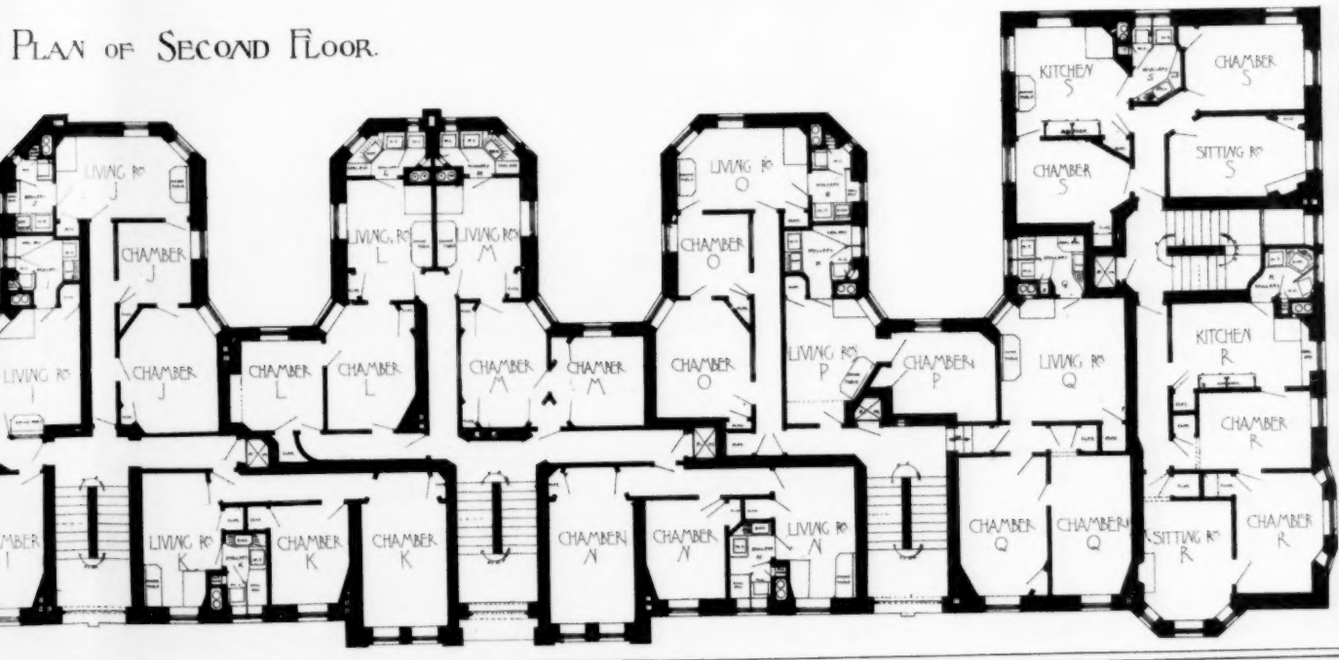
CONTINUATION OF PLAN, JOINED AT AA

BLOCK PLAN



PLAN O

PLAN OF SECOND FLOOR.



Heliotype Printing Co Boston.

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Doorway in Front of Church at
Philadelphia, Pa.

Heliotype Printing Co Boston.

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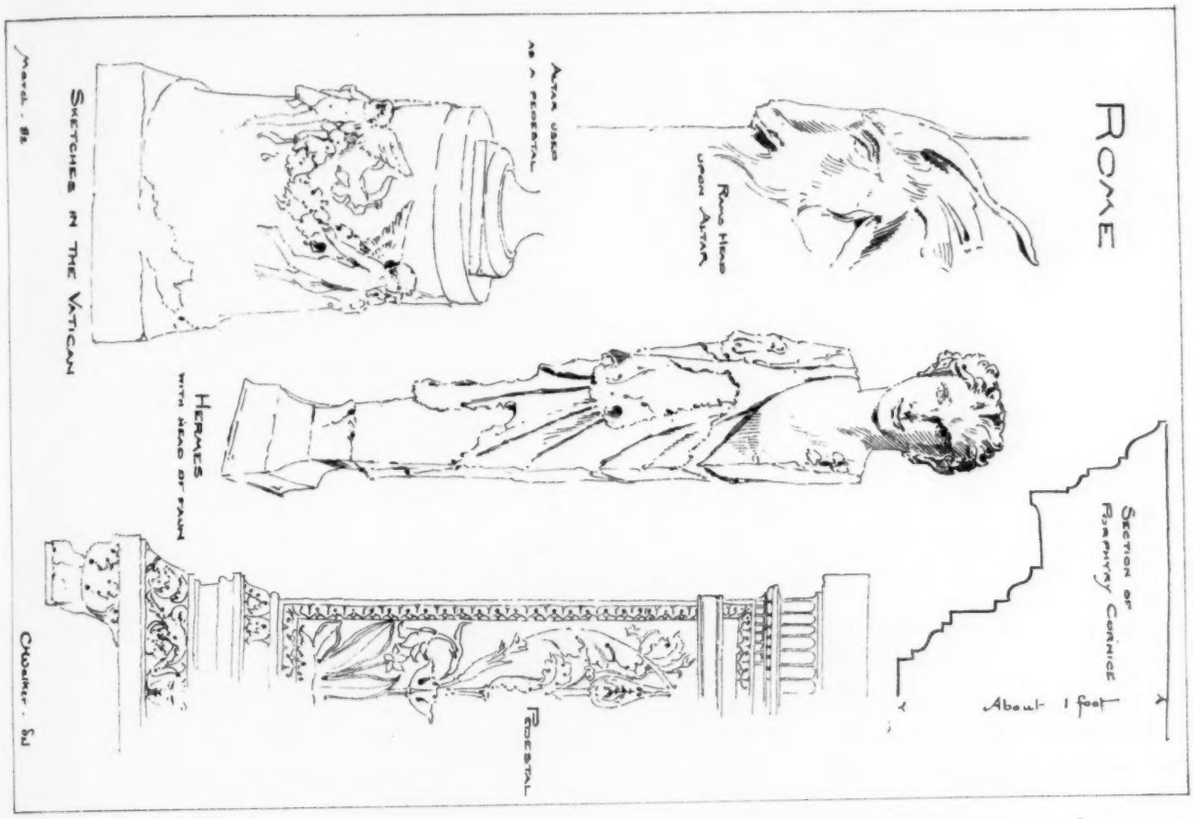

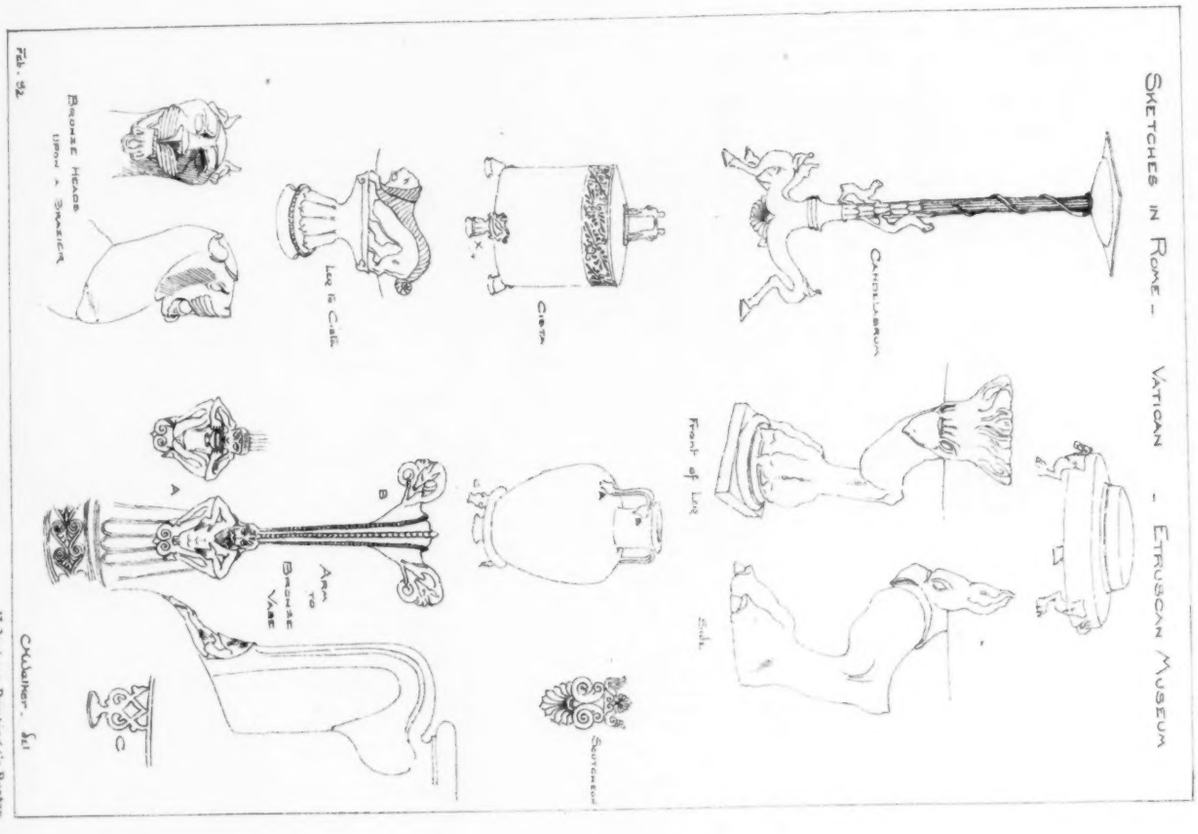

architects, and others employed expressly for this purpose, have visited the different cities of our country, and made careful study of what has been done in London by Hon. George Peabody and others, as well as the many excellent homes, either detached or in compartment form, in other parts of Europe. Thus, from the best experience of the past the aim has been to see how the greatest home comfort could be had for the smallest rent, and the conclusion arrived at has been, all things considered, that an apartment-home, properly constructed, would best attain this result. Having fixed upon the style of building, the next object was to secure a location which would be the nearest approach possible to the largest number to be benefited. It must be in a healthy and unexceptionable neighborhood, and to this end, as a result of much careful thought and investigation, a plot of land was secured on Franklin Street, on the highest ground in Greenpoint, with excellent drainage and on good, natural, gravel-soil bottom, within five minutes' walk from the Tenth and Twenty-third Street ferries from New York, and situated in the centre of a large population, convenient to schools, churches and every means of refinement.

The building is to be known as "The Astral Apartments," and it may seem needless to say that every detail has had thoughtful consideration. The construction of the building was put in the hands of the Morris Building Company, who have been constantly at work for more than two years in the preparation of plans, etc. The edifice is rapidly nearing completion and may be described, briefly, as follows:

The principal features of the construction are perfect light, ventilation and sanitary arrangements. Buildings of a like nature, although on a smaller scale, have been examined with a view to remedy the defects which experience has brought to light, and it is believed that the present building will be the most perfect example of an apartment-house in the country. The apartments are totally isolated from one another by fire-walls; they have outside light and ventilation to every room, the means of escape in case of fire are ample, and, above all, the sanitary arrangements are absolutely perfect, and of sufficient extent to give every occupant the proper conveniences of living. A study of the plan will serve to show how perfectly these requisites have been carried out.

The building fronts on Franklin Street 200 feet, on Java Street 135 feet, and on India Street 75 feet, and it will be noticed that at intervals in each façade are openings extending from basement to attic, which, while enclosing the staircases, leave them open for perfect ventilation and light. They will be seen to divide the building into different sections with six distinct sets of staircases, which are built of stone between massive fire-walls. Added to this, to make assurance doubly sure, regular fire-escapes have been placed in the rear of the whole system, connecting each story from roof to basement. From the landings of main staircases the different apartments are entered through separate hallways, and each set of rooms is connected with a large lift built in a brick shaft and supplied with metal doors at each story.

An examination of the apartments themselves will show that they consist of from three to five rooms each, thus giving accommodations for large or small families. The English system has been adopted in the culinary departments, giving a good-sized "living-room," off from which is the "scullery," containing the sink, a set of wash-trays and a large fuel-box, besides access to the water-closet, every one of which has direct outside light and air. By an ingenious location of the chimneys, they are also made to serve as direct ventilating-flues from each closet. All the plumbing is thus brought into direct lines through the stories, and the pipes are laid so as to be exposed for cleanliness and inspection.

In the basement, on India Street, is a large reading-room and library, open from side to side for light and ventilation, containing an immense terra-cotta chimney-piece, to give it a home-like appearance. On the corners of the first story are stores, designed to be conducted upon some coöperative plan as a source of revenue to reduce the rent.

From a view of the exterior it will be seen that the tremendous size of the building has led the architects to the massive round-arch style of architecture, and the doorways are thus formed by the noble Norman archways, the central façade on Franklin Street being rock-face stonework through the first and second stories, and running up in a double bay, projecting four feet, are united again at the top by an arch and covered cornice of terra-cotta. Each corner, also, of each façade is flanked by projecting bays of brick, and the whole building is capped by an arcaded cornice of brick and terra-cotta, the gables having massive flanking chimneys. Brown-stone is used as the foundation of the first story up to the window-sills, with the central façades of the same material; otherwise, the whole structure is of brick, the ornamentation being quiet and refined in stone and terra-cotta.

The cost of the entire property will be from $250,000 to $275,000. The building is being erected by Van Dolsen & Arnott, builders.

"THE WARREN," ROXBURY, MASS. MR. CARL FEHMER, ARCHITECT, BOSTON, MASS.

SKETCHES MADE IN THE VATICAN MUSEUM, ROME, BY MR. C. H. WALKER, ARCHITECT, BOSTON, MASS.

DOORWAY OF CHURCH, CORNER OF THIRTY-SEVENTH AND CHESTNUT STREETS, PHILADELPHIA, PA. MR. T. P. CHANDLER, JR., ARCHITECT, PHILADELPHIA, PA.

THE TREATMENT OF SEWAGE.[1] — II.

SEWAGE.

WE now turn to water-carried sewage — its composition, value and treatment.

By the phrase "the sewage of a town" is implied: —

(1) The excreta (solid and liquid) of the population.

(2) The refuse from kitchens, laundries, etc.

(3) The drainings from stables, slaughter-houses, etc.

(4) The liquid impurities resulting from various trade operations (breweries, dye-houses, fellmongeries, etc.)

(5) The washings of public thoroughfares, etc.

(6) Domestic and subsoil water.

To speak broadly, we may define sewage as "the refuse of communities — their habitations, streets and factories."

It is manifest, therefore, that it is not possible to define broadly what constitutes "average sewage." The quantity and quality of the sewage of a town will be influenced by the following, amongst other conditions: —

(1) The number and nature of the manufactures and trade operations peculiar to the place, and which are drained into the sewers.

(2) The existence of an excessive number of stables (such as result from the presence of barracks).

(3) The volume of water supplied to the inhabitants.

(4) The proportion of rain or surface water admitted into the sewers.

(5) The quantity of subsoil-water that leaks into the sewers.

(6) The density and general habits of the people.

(7) The season of the year.

(8) The time of day.

Sewage may be subdivided into —

1. Domestic sewage.
2. Manufacturing refuse.
3. Rain and storm water.

We shall find, when we come to discuss the treatment of sewage, the first great difficulty is the large quantity to be dealt with. It has been suggested to meet this difficulty of quantity by adopting a duplicate set of sewers, the one for sewage proper (domestic and manufacturing) and the other for storm and rain water, or at any rate for the larger part of the rain-water. For irrigation purposes, no doubt, it is desirable to have the domestic sewage as little diluted as possible, but for chemical treatment dilution within certain limits is not an evil. A separate system must be more expensive, besides which it robs the sewers of one means of natural and effective flushing, such as occurs after heavy rains. It also excludes from the sewage to be treated many materials (*e. g.* road-washings) that certainly need treatment as much as, if not more than, any sewage proper. To limit the water for removal of filth to its smallest quantity is a sound principle, but there is a danger in over-reduction. The most earnest advocates of the separate system scarcely see their way to exclude from the public sewers the rain falling on private property, as this would for the most part necessitate two sets of house drains. It may be admitted that both the separate and combined systems have their merits and defects, and that certain local conditions may determine the choice of the system.

The arguments used in favor of a separate system are: —

(1) Greater uniformity in the quantity of sewage conveyed.

(2) The prevention of deposits, the dimensions of the pipes being capable of more accurate adjustment, permitting them to be daily filled to their maximum at the hour of maximum flow.

(3) If the sewage has to be pumped, expense will be saved by the limitation of quantity.

[1] A paper by Dr. C. Meymott Tidy, read before the Society of Arts, April 14, 1886, and published in the *Journal* of the Society. Continued from No. 566 page 208.

(4) Prevention of floodings from the capacity of the sewers being overtaxed, or from obstruction taking place in the surface channels during times of heavy rain, or on the occurrence of a rapid thaw after a long period of snow. Danger arising from the gases in the sewers being forced by the rush of water thus filling the sewer, being driven through the nearest outlet, and possibly through house connections, will be avoided.

(5) Prevention of precipitation, and so of deposit in the sewers, from earthy matters (such as building lime) being carried in at storm time, together with road detritus, leaves, etc., and which, under ordinary conditions, might not be removed until the next heavy rain.

(6) If obstruction occurs, a comparatively small volume of water will be sufficient to flush the sewers effectively on account of the relative smallness of pipes.

(7) That with small pipes, good ventilation of the sewers may be more easily effected.

(8) That the nuisance arising from organic matters being carried into the pipes at the time of storm, and putrefying on the upper portions of the sewer-pipe, where, under normal conditions of flow, it forms a slimy coating and develops swarms of organisms, will be prevented, the sewers being filled daily to their maximum working capacity.

(9) That the quantity of sewage to be dealt with would be greatly decreased.

On the other side it is urged that, however sound it may appear in theory, to urge "the rainfall to the river, the sewage to the soil," there are manifest objections to the separate system: —

1. That it is practically impossible thus to separate rain-water and sewage, things that ought not to be in the rain-water pipes being certain to get there.

2. That the road-washings and filth making the first wash of a heavy storm is most often far more filthy than the very worst sewage, and, therefore, specially requires treatment.

3. That storm-water is the natural flush-water for the sewers.

It may be said that the third objection may be met by automatic flush-tanks; the second by effective scavenging; the first by educating the people. We have not yet attained the ideal of sanitary work. A separate system would, I fear, mean the intermittent pollution of our water-courses. There are legal difficulties, too, in carrying it out, which I will not discuss.

I do not deal with the question of cost, except to say that the mere size of pipe is not the only, nor is it the main question to be considered in laying pipes, the excavation, paving, etc., being practically the same, whether pipes be large or small.

COMPOSITION OF SEWAGE.

Sewage, we have said, is a complex fluid: — no absolute average analysis can therefore be stated. It will, however, be a good starting point to regard the average sewage of London as a standard, and to speak of sewage of greater polluting power as a strong sewage, and of less polluting power as a weak sewage.

A large number of samples of London sewage were examined by Dr. Frankland and myself between 1883 and 1884. The following are certain average details worthy of record. The results are stated in grains per gallon of 70,000 grains: —

	Maximum.	Minimum.	Average.
Matters in solution	49.77	28.42	45.213
Matters in suspension	163.9	21.4	48.65
Ammonia	6.527	2.515	3.012
Chlorine	8.33	5.67	7.21
Organic carbon	2.847	2.118	3.069
Organic nitrogen	2.676	0.964	1.738

Average ratio of N to C — 1 : 1·77.

These results, however, take no note of true storm sewage.

Whilst an assistant of Dr. Letheby, I made, jointly with him, a very large series of analyses of sewage from ten of the large city sewers, the rate of flow being, on an average, 3,500 gallons per minute. The following are average details: —

	Day sewage.	Night sewage.	Storm sewage.
Soluble Matters	55.74	65.09	70.26
(a.) *Organic*	15.08	7.42	14.75
Containing nitrogen	5.44	5.19	7.26
(b.) *Mineral*	40.66	57.67	55.71
Containing phosphoric acid	0.85	0.69	1.03
" potash	1.21	1.15	1.61
Suspended Matters	38.15	13.99	31.88
(a.) *Organic*	16.11	7.48	17.55
Containing nitrogen	0.78	0.29	0.67
(b.) *Mineral*	22.04	6.51	14.33
Containing phosphoric acid	0.89	0.64	0.98
" potash	0.08	0.04	0.16

It may be of importance to record that at the time the samples were collected for analysis, 37.5 gallons (6 cubic feet) were contributed per head of the population. Of this, 80 per cent was represented by the water-supply. The following Table exhibits, therefore, the weight in pounds of the chief constituents of 375,000 gallons of sewage (mid-day sewage being taken for comparison) furnished daily by 10,000 people, and its subdivison into excretal and non-excretal refuse: —

Constituents of 375,000 gallons.	From excreta.	From refuse other than excreta.	Total.
	lbs.	lbs.	lbs.
Soluble Matters	957	2029	2986
(a.) *Organic*	733	75	808
Containing nitrogen	200	91 (?)	291
(b.) *Mineral*	224	1954	2178
Containing phosphoric acid	30	16	46
" potash	34	31	65
Suspended Matters	316	1628	2044
(a.) *Organic*	356	507	865
Containing nitrogen	23	19	42
(b.) *Mineral*	60	1121	1181
Containing phosphoric acid	21	27	48
" potash	8	—	8

Putting those results in a few words, we may say every 10,000 persons in London contribute, on an average, 375,000 gallons of sewage daily, and that this includes about 1,671 lbs. of organic matter, containing 333 lbs. of nitrogen, and 335 lbs. of mineral matter, containing 94 lbs. of phosphoric acid and 69 lbs. of potash.

Of course, the total quantity in any given town will depend on a variety of causes. It is certain to be as much as the water-supply, but it may be a great deal more. In London, as we have said, it may be taken that 80 per cent of the sewage is represented by the water-supply.

Hofman and Witt (1857) examined the sewage from the Savoy Street sewer, an average sample being obtained by the admixture of samples taken hourly during the twenty-four hours. The results were as follows, stated in grains per gallon: —

(a.) *Organic*	30.70
Containing nitrogen	6.76
(b.) *Mineral* —	(?)
Containing phosphoric acid	1.85
" potash	1.03

A large number of sludge deposits (to which no precipitant was added) have been examined for the purpose of determining the ratio of organic nitrogen to organic carbon. The results are marked by a great want of uniformity, ranging from a ratio of 1 to 3.4, to a ratio of 1 to 9.1.

Major Scott, after a review of a large number of analyses, says, "we may assume that with each [one] part of the three fertilizers, nitrogen, phosphoric acid and potash, there will be associated in the sewage sludge of London 20 parts, 25 parts and 56 parts respectively of organic matter."

Nitrogen or organic matter	1 : 20
Phosphoric acid to organic matter	1 : 25
Potash to organic matter	1 : 56

It will be impossible for us to discuss the pollution from sources other than excreta which, together, make up the complex fluid we designate sewage. With respect, however, to stable drainage, I would note that an average horse excretes thirteen times as much fæcal matter by weight, and about fifteen times as much urine, as an adult man. It may be noted further, that both horses and cows produce by respiration about thirteen or fourteen times as much carbonic acid as an adult man, and as a consequence vitiate the air in the same ratio. (Taking 1,200 cubic inches as the quantity of CO_2 produced per hour, by a man, 14,750 inches is produced by a cow or horse.)

There is, however, a not unimportant consideration which occurs in considering the character of a town sewage, viz., the feeding of horses. The difficulty of dealing with the stable refuse where the horses have been fed upon maize, is far greater than where the animals have been fed on ordinary corn. In my own experience as a health officer I have had abundant evidence of the peculiarly offensive character of the manure in such cases.

In all inquiries respecting the sewage of a town, the nature and amount of the liquid refuse from manufacturing works (if admitted into the sewers) needs most careful consideration. Of these I may specially mention brewery refuse, the waste being of a singularly offensive nature. To add to the difficulty, a considerable quantity of yeast is discharged with the waste liquor, whilst the high temperature of the refuse intensifies the trouble of treatment. The refuse from certain dye-works, etc., are also difficult to deal with.

As regards street-washings, the following details may be worth noting: — Granite roads were found at the time of a heavy shower to discharge water into the gullies containing 800 grains of solid matter per gallon, of which 219 grains were in solution and 520 in suspension. The precise composition of the washings, will, however, depend on many conditions, such as extent of traffic, previous period of drought, etc. The water from wood paving, taken about the same time as the above, was found to contain 50 grains of solid matter per gallon, of which 40 was in solution and 10 in suspension. Some 20 samples of road-washings taken from all kinds of roads under circumstances as nearly as possible similar to the conditions named above, were mixed together. The water contained 280 grains of solid matter per gallon, of which 120 were in solution and 160 in suspension.

It would be outside my province to discuss the engineering details of a sewage scheme. Yet let me note that sanitary medicine must take cognizance of sewage in its progress through a town. There must be sufficient velocity, as well as an economy of scouring power,

in order to prevent the solid matters from collecting. The ventilation of the sewers is again a question of importance upon which authorities differ, and no wonder, seeing how formidable are the difficulties.

DISCHARGE OF CRUDE SEWAGE INTO RIVERS.

Nothing is more certain than that the discharge of crude sewage into a river is unadvisable. It is, in fact, a method of shifting a nuisance from the nuisance-producer to his immediate neighbor. The evils arising from such discharge depend mainly upon the suspended matter in the sewage. This, first of all, floats about near the outfall, certain portions of the organic matter combining with aluminous compounds from alluvial mud raised by tides and steamers. In time, deposition takes place. In the course of flow the various ingredients are found to deposit more or less in the order of their specific gravity. The first deposits are mainly mineral, with small quantities of organic matter carried down at the same time. The later deposits are mostly finely divided organic matter, along with a small quantity of mineral matter. Thus there occurs, as the result of flow, a natural sorting of the matters in suspension.

The organic impurities of the sewage in this manner collect in the bed of the river and ultimately putrefy. The gases developed and bottled up in time render the solids sufficiently buoyant to rise to the surface where the gases of putrefaction (sulphur and phosphorus compounds for the most part) are given off, the solid matter again sinking to undergo fresh putrefactive changes.

Thus the nuisance from the discharge of sewage into the river may be far more offensive at a short distance from the outfall, than at the outfall itself. Further, at a point of slack water, the nuisance arising from these solids in suspension may be greatly aggravated.

As regards the matters in solution, provided the sewage be sufficiently diluted and allowed a certain flow, complete purification will be effected by oxidation. This fact is nowadays admitted by nearly all chemists, and need not detain us further. The self-purification of running water is, however, not to be regarded as an argument in support of allowing crude sewage to be discharged into a river.

Before dealing in detail with the value and the treatment of sewage, a few historical details may be permitted.

A Royal Commission was appointed in 1857 (known as "The Sewage of Towns Commission") to inquire into the best mode of distributing the sewage of towns, and applying it to beneficial and profitable uses. Their deliberations lasted for eight years, a preliminary report being made in 1858, a second in 1861, and a final report in 1865. Their conclusions were in favor of irrigation, their belief being that irrigation processes might be made more or less profitable. They say: —

"1. The right way to dispose of town sewage is to apply it continuously to land, and it is only by such application that the pollution of rivers can be avoided."

"2. The financial results of a continuous application of sewage to land differ under different local circumstances; first, because in some places irrigation can be effected by gravity, while in other places more or less pumping must be employed; secondly, because heavy soils (which in given localities may alone be available for the purpose), are less fit than light soils for continuous irrigation by sewage."

"3. Where local circumstances are favorable, and undue expenditure is avoided, towns may derive profit, more or less considerable, from applying their sewage in agriculture. Under opposite circumstances, there may not be a balance of profit; but even in such cases a rate in aid, required to cover any loss, needs not be of large amount."

In 1862 (*i. e.*, during the life of the previous Commission) a select committee of the House of Commons was appointed (called Select Committee on the Sewage of Towns) to inquire into "the best means of utilizing the sewage of the cities and towns of England, with a view to the reduction of local taxation, and the benefit of agriculture." They reported in April and July of 1862.

In May, 1865, the first Rivers' Pollution Commission was appointed "to inquire into the best means of preventing the pollution of rivers." They made three reports, the first in 1866, and the second and third in 1867. In February, 1868, their commission was revoked, a second Rivers' Pollution Commission being appointed in April of that year. The subjects embraced in the reports of the two Rivers' Pollution Commissions may be best stated in the language of their commissions. They were appointed "for the purpose of inquiring how far the present use of rivers or running waters in England for the purpose of carrying off the sewage of towns and populous places, and the refuse arising from industrial processes and manufactures, can be prevented without risk to the public health, or serious injury to such processes and manufactures, and how far such sewage and refuse can be utilized and got rid of otherwise than by discharge into rivers or running waters, or rendered harmless before reaching them; and also for the purpose of inquiring into the effect on the drainage of lands and inhabited places, of obstructions to the natural flow of rivers or streams, caused by mills, weirs, locks, or other navigation works, and into the best means of remedying any evils hence arising." This Commission made six reports, the first in 1870, and the sixth in 1874.

In 1875, a committee of the Local Government Board was appointed to make special inquiry into the practical efficiency of the chief systems of sewage disposals then in operation, and for which loans had been sanctioned by the Board. It reported in 1876 (Sewage Disposal, Report of a Committee, 1876): —

"4. That most rivers and streams are polluted by a discharge into them of crude sewage, which practice is highly objectionable."

"5. That, as far as we have been able to ascertain, none of the existing modes of treating town sewage by deposition and by chemicals in tanks appear to effect much change beyond the separation of the solids and the clarification of the liquid. That the treatment of sewage in this manner, however, effects a considerable improvement, and, when carried to its greatest perfection, may in some cases be accepted."

"6. That, so far as our examinations extend, none of the manufactured manures made by manipulating town's refuse, with or without chemicals, pay the contingent costs of such modes of treatment; neither has any mode of dealing separately with excreta, so as to defray the cost of collection and preparation by a sale of the manure, been brought under our notice."

"7. That town sewage can best and most cheaply be disposed of and purified by the process of land irrigation for agricultural purposes, where local conditions are favorable to its application, but that the chemical value of sewage is greatly reduced to the farmer by the fact that it must be disposed of day by day throughout the entire year, and that its volume is generally greatest when it is of the least service to the land."

"8. That land irrigation is not practicable in all cases; and, therefore, other modes of dealing with sewage must be allowed."

This being the sewage with which we have to deal, our object is twofold: —

(1) To make use of any valuable constituents that it may contain; and

(2) To purify it.

Sanitary requirements, however, demand that no nuisance should result in the course of the operation of treatment.

THE VALUE OF SEWAGE.

The basis on which the theoretical calculation of the value of sewage may be determined is, authorities suggest, simplicity itself.

It may be conceded that the animal excreta are, practically, the only constituents of manurial value.

Having determined the value of the excreta of a mixed population, it is only necessary to know (1) the population of any given town, and (2) the quantity of sewage produced during the twenty-four hours, to estimate the manurial value of the sewage. It may appear strange, however, the question being one, we are told, of such simplicity, that authorities before the Select Committee of the House of Commons (1862) should have stated it so variously as from ½*d.* to 9*d.* per ton. Certain details upon which these money estimates were founded may be noticed.

The Rivers' Pollution Commissioners, who fix its value at about 2*d.* per ton, say, "The money value of these constituents (combined nitrogen, phosphoric acid and salts of potash), dissolved in 100 tons of average sewage, is about 15*s.*, whilst that of the suspended matters is about 2*s.* That is to say, that 100 tons of average sewage are worth 17*s.*, or about 2*d.* per ton."

Hofmann and Witt arrived at a similar conclusion. Six-sevenths, they say, of the valuable matters in sewage are in solution. Reckon that 700 tons of sewage contains one ton of solid matter, having a total money value of £6 0*s.* 3*d.* (£5 5*s.* for dissolved matters, and 15*s.* 3*d.* for suspended matters), it follows that the one ton of sewage is worth about 2*d.*

Lawes and Gilbert arrive at a similar conclusion. Reckoning the dry-weather sewage of London as 24 gallons daily per head (= 40 tons per head per annum), and the ammonia as 10 lbs. per head per annum, the money value would be 2*d.* per ton, whilst if the ammonia be taken at 12½ lbs. per head per annum, it would be 2½*d.* per ton.

Take it, says another authority (Mr. Bailey Denton), that the fertilizing elements of one person (worth, let us say, 8*s.* 4*d.* per year) are diluted with 61 tons of water (an average quantity contributed by each individual to the outflow from towns), the value of sewage is 8*s.* 4*d.* divided by 61, or 1⅔*d.* per ton.

Such are some of the estimates.

But there were those who desired to be still more precise in their calculations. Authorities who desired to be cautious valued the London sewage, when the population was 3,000,000, at £1,000,000 sterling, that is at the low estimate (ridiculous to many people of 6*s.* 8*d.* as the annual value of each person's excreta). The two chairmen of Parliamentary committees (Mr. Brady and Lord Robert Montagu), after a long inquiry, came to the conclusion that London sewage is equal in manurial value to 212,842 tons of Peruvian guano, with a market price of £2,890,000. Hofmann and Frankland considered that 1,250 tons of London sewage contained the fertilizing matters of one ton of Puruvian guano, whilst a very great authority indeed, one before whom the chemical world justly bows in admiration would listen to nothing less as the annual value of the metropolitan sewage than £4,081,430.[2]

Such being the teaching of science as to the value of sewage, nothing was more natural than to urge upon authorities its application to land. And here let me say at once, that I distinguish between utilization of the sewage and its purification. I consider them together, but they are totally different questions.

Science had its story to tell. The land acts, first, as a mechanical filter, and, secondly, as a chemical laboratory. As a filter, the larger insoluble particles are arrested on its surface, whilst the smaller are

[2] See Voelcker's report on the "Commercial Value of Sewage and Soil Manures," published in the report of Messrs. Rawlinson and Read to the Local Government Board.

entrapped a few inches down. The water is absorbed, *i. e.*, each earth particle becomes covered with a liquid coating. Now follows the work of the chemical laboratory. The enormous surface of liquid thus formed is favorable to coercing the combination of oxygen with the organic impurities of this subdivided sewage-water, carbonic acid and water together with nitric acid, oxidation being assisted possibly by the presence of certain micro-organisms resulting. The organic matters on the surface soon undergo slow burning. The nitric acid is your plant feeder.

The process of slow burning is the work of oxygen, whilst that of nitrification, as the researches of Pasteur and Warrington have shown, is due to the combined work of oxygen and of certain lower forms of life. Hence, to purify, you need not only a flow of sewage but a flow of air, that is, constant movement regulated in its order. As regards the lower organisms, they may be already in the soil or be provided by the sewage. The purifying power of a soil, however, is peculiar to itself. You cannot completely control aëration, although drainage and loosening of soil will promote it, and an excess of irrigation stop it. In fact, the soil as a purifying agent, is to say the least capricious.

Purification, the action of the soil, is greatly assisted by the action of vegetation. In winter time, when there is no vegetation, the soil only must do the work.

Enthusiasts full of faith were found to embark in private sewage-farms, whilst local authorities, anxious to save the rates, offered the sewage to farmers in their neighborhood for a corresponding return.

It was not long, however, before a certain unpleasant awakening occurred, owing to the farmers declining even to accept the sewage.

Reasons for this were sought. Was it due, as was suggested, to the ignorance of farmers, and their blind attachment to old-fashioned ways? This contention was scarcely feasible, seeing how keenly they appreciate newly-invented manures (*e. g.*, superphosphate, alkaline nitrates, etc.), new implements, new methods of subsoil drainage, etc.

Men began to suspect one of two things, either that there was (*a*) some obstacle to the agricultural use of sewage; or (*b*) that its theoretical value was very far from being its practical worth.

But other facts than those adduced by the mere working farmer, presented themselves in the failure of the farming attempts of enthusiastic irrigationists. Despite the statement of Mr. Edwin Chadwick, who, in 1844, propounded his views with the authority of the Board of Health, that liquid manure was at all times preferable to solid manure, and suitable for all crops and all soils, we have to record one long series of miserable failures in the attempt to find experimental proof of theoretical estimates. The failure of Mr. Smith's farm (Deanstone), of Mr. Neilson's farm, of Mr. Telfer's farm, of Mr. Kennedy's farm (Myremill), of Mr. Huxtable's farm, of Mr. Chamberlain's farm, of Mr. Littledale's farm, and of Mr. Mechi's farm (all of which cases have at various times been held up as wonderful illustrations of the money success of irrigation) supply the unanswerable answer to Mr. Edwin Chadwick and his school.

The Rugby farm was pronounced "unremunerative" by its first manager (see Mr. Campbell's letter, *Times*, November 18, 1864), whilst it was abandoned by Mr. Congreve, and by Mr. Walker who succeeded Mr. Campbell. The story of one and all sewage-farms is a history of commercial failure.

The irrigationists, however, still pointed those who doubted the commercial success of sewage farming to the Craigentinny meadows in Edinburgh. We were told (correctly, no doubt), that in good seasons £20 to £30 worth of green produce had been realized per acre (say £25 average). But it is no secret,

(1) That in these meadows the quantity of sewage used has been from 10,000 to 13,000 tons per acre, in other words, taking the produce as worth £25, the sewage employed had a value, irrespective of rent and farming expenses, of less than ¼*d.* a ton.

(2) That the sewage was not used continuously, and when not wanted on the land, was diverted into the sea.

Nothing is more certain than that the theoretical value calculation of sewage, based on the supposition that the manurial elements of a sewage, extracted and dried, are their value in solution must be regarded as an extravagant dream of enthusiasm. Such calculations have entirely overlooked the effects of dilution, and the presence of a mass of worthless material. Nay, more, the "profligate associates," as they have been called in sewage, are not merely worthless, but worse than useless. Sewage in this respect is not singular. Thus whilst rotten farmyard manure may have an estimated value of 15*s.*, its practical value rarely exceeds one-half its theoretical. No doubt the enthusiasts of a few years ago have learnt a lesson at some cost. Mr. Bailey Denton, admitting the fallacy of old calculations, still clings with praiseworthy consistency to some of his old ideas of value. "Even," says he, "with such a greatly diminished value (*i. e.*, 1½*d.* to ¼*d.* a ton), the country has a valuable property which it is our duty to preserve."

We are constantly reminded, moreover, of the success of irrigation in India, Egypt, Persia, etc. The simple application of water to the soil in dry and warm climates increases fertility. Moreover, we must admit that sewage has a higher manurial value than mere water. But the cases are not comparable; a climate having the temperature of our own with frequent rain (rain falling 150 days, on an average, out of 365), is not to be compared with one of tropical heat and of long-continued drought. The sandy soil of Gennevilliers or of the Dantzic farm are no cases in point. Admitting as a fact a certain manurial value in sewage, the English farmer, it is certain, would sooner sacrifice the manurial value than be compelled always to have the water. For two difficulties stares him in the face (and a sanitary authority demands these conditions), first, to be compelled to take the sewage at all times (day and night, Sundays and week days) all the year round (summer and winter) whether his soil wants it or not, or whether he has any crops or not that can profitably use it, at all stages of their growth, seed time and harvest, and, secondly, so to utilize it as to produce an effluent which at all time, all the year round, shall neither produce a nuisance, nor pollute a public watercourse. In times of frost — during the heavy rains of spring and autumn — the farmer finds he has no alternative (his land being practically impenetrable) but to let the sewage pass away unpurified into the nearest stream. He finds, too, that the use of sewage again is prejudicial during the maturity and ripening of the crops. These difficulties were grasped by the Parliamentary Committee of 1862, who reported, that "it was desirable that those using sewage should have a full control over it, so that they might apply it when and in what quantities they may require."

Local authorities have, indeed, learnt the truth of these statements, since when they adopt an irrigation scheme they know that it is necessary for them to acquire land, and not trust to the farmers in the neighborhood.

I am aware that the difficulty of frost is supposed to be met by the increased temperature of the sewage. If time, however, be allowed for the ground to be aërated, and the weather be so cold as to freeze it, some of the sewage at least must flow over frozen ground. This is the dilemma. Adopt means to aërate your ground, and it will become frozen. Neglect to aërate your ground, and it is useless, or practically so. The difficuly of storm-water is said to be met by a certain portion of land being kept for storm sewage, and possibly planted with osiers. But this does not meet the case. Your osier beds can become water-logged as well as your farm. It is no doubt an advantage to have a reserve, but it only meets a part, and a very small part, of the real difficulty.

In considering the question of working cost, quite apart from the expense of preparing the land, it is stated on good authority (Local Government Board Report, p. 33) that sewaged land requires more horses and double the amount of manual labor than ordinary arable land. This means greater capital. "To properly stock (I am quoting from the report) and work a sewage-farm upon which the main produce is consumed, quite five times the usual amount of money will be needed."

There is another point to be recorded, the enormous care needed in the management of a sewage-farm. Dr. Carpenter understands this when he laments "how mischievous people often break down the carriers and other works, and let the sewage run where it ought not to go — in that way, getting into the effluent water."

We have admitted a certain manurial value in sewage. Before we proceed to consider the question of producing a good effluent, some other points bearing on its fertilizing powers come before us, viz.:

(1) The methods of applying sewage to land.
(2) The soil best suited for irrigation.
(3) The crops most suitable for a sewage farm.
(4) The value of the crops so grown.

[To be continued.]

MODERN CAMEO CUTTING.

THE substance of which a modern cameo is made is a piece of sea-shell. Every one must have noticed that while the outside of many shells is rough and unseemly, the interior is perfectly polished, and often of a brilliant color. If the shell be broken, the way in which the two layers lie upon and pass into each other may be clearly seen. The species used by the trade will be described farther on, but we may here premise that they are chosen on account of the thickness and hardness of the layers, of the contrast of color between them, and the presence of knobs on the exterior surface which render it possible to work in relief.

When a cameo is begun, a piece of the shell, rather larger than the ornament is intended to be, is cut out and affixed to a wooden holder by means of a substance which looks like a coarse kind of sealing-wax, and seems to the touch as firm as stone, but at once yields to any high degree of heat. The inner surface of the shell is of course the lowest, and on the gray outside the master draws a rough outline of the design, and places the work in the hands of an apprentice, who reduces the knob by means of a file to the requisite height, and with the same instrument removes all the gray matter that lies outside the boundary lines, and dresses the whole of the irregular surface. In this condition a cameo

looks like an irregular piece of chalk rising out of a small plate of colored glass. It is now returned to the master, who again draws the design in pencil upon it, but more carefully this time, as the places in which the dark background has to be seen through the white mass must be indicated; and from him it passes to another apprentice or workman who has already learned the use of the *bulino* or burin. This is an instrument which is present in at least twenty forms in every work-shop of importance. The coarser almost resembles a stone-cutter's tool; the finer are nearly as delicate as those used by an engraver. Thus, from the beginning to the end, the work is always submitted to the master's eye, and always passes into more skilful hands, until he himself adds the finishing touches.

It has of late years become the fashion to have cameo portraits taken. This form of art is chiefly patronized by the Americans. When such a portrait is made, the whole work, except the mere filing down, is usually done by the master's own hand. The likeness may be taken from a photograph, but the cameo-cutter greatly prefers a study from life. As a rule, he demands three sittings, of about a quarter of an hour each. In the first, he makes a general outline of the face; in the second he adds dignity, loveliness and expression; in the third he adds or corrects details. It must be confessed that these likenesses are often striking, always clever, and generally abominable. All the resources of the master's art somehow fail to make Brother Jonathan look like a Greek hero, and, as the cutter has some classical hero always in his mind, his work is apt to become an unconscious satire. We speak of Brother Jonathan, but must confess that John Bull and his wife are not free from the same vanity. The British matron considers such portraits exquisite; they are for her the criterion of all art, the *ne plus ultra* of truth and beauty, the touch-stone by which to test good taste; but we cannot defer to her opinion.

The great fault of most modern cameos is an excessive fondness for detail. The more labor that is spent upon a piece the more valuable it becomes. Besides this, the master takes a pleasure in the exercise of his skill; he is proud of showing his work through a lens and pointing out the fineness of the single lines, and the perfection of the whole execution. This exactly suits the taste of many of his best customers, and so the general purpose of a design is often hidden under a crowd of minute felicities. It is because the Neapolitan workmen are comparatively free from this fault that their work ranks so highly as it does; but even they fall into it at times, especially in their portraits, the cheapest of which are usually also the best.

The shells used by the cameo-cutter are of three kinds. The most valuable, *Casis tuberosa*, is known in the trade as *Conchiglia serpentina*. When the shell is perfect, the external layer is of a spotless white, while the lower one seems at the first glance to be black; it is in fact of a dark gray tint, something like unpolished steel, with brown reflections. But such specimens are exceedingly rare, as much as twenty-five francs being sometimes paid for a single one. In imperfect examples, the white layer is either too thin, or is spoiled by yellowish spots, while the black one is wanting in thickness and hardness. These shells are bought by the hundred at the price of from six to eight hundred francs. About a third of the number are worthless, while only single parts of many of the rest can be used, and then only for inferior articles. — *London Saturday Review.*

COMMUNICATIONS

APPLICATION OF THE MARKING SYSTEM TO SPEECH.

WASHINGTON, D. C., November 3, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — I read with interest in No. 566 of the *American Architect* your remarks on the system of points devised by the *Société Centrale des Architectes de Belgique* to assist committees in judging of the relative merits of architectural drawings submitted for competition. This system resembles very closely that in use by the United States Civil Service Commission for marking candidates for government positions; in fact, there are many special applications of the idea which you can readily call to mind. However, the first person whom I know who proposed to apply this system to general use was a distinguished officer of the Corps of Engineers, U. S. A., and more than thirty years ago he claimed it as his own discovery, and described it in a magazine article under the title of "A new system of English grammar." He explains it as follows:

"This system is exceedingly simple and easily explained in a few words. Let us represent by the number 100 the maximum of every human quality — grace, beauty, courage, strength, wisdom, learning — everything. Let *perfection*, I say, be represented by 100, and an absolute minimum of all qualities by the number 1. Then, by applying the numbers between to the adjectives used in conversation, we shall be able to arrive at a very close approximation to the idea we wish to convey.

"Let this system be adopted into our elements of grammar, our conversation, our literature, and we become at once an exact, precise, mathematical, truth-telling people. It will apply to everything but politics; there, truth being of no account, the system is useless. But in literature how admirable! Take an example: As a 19 young and 76 beautiful lady was 52 gaily tripping down the sidewalk of our 84 frequented street, she accidentally came in contact — 100 (this shows that she came in close contact) with a 73 fat, but 87 good-humored looking gentleman, who was 93 (*i. e.*, intently) gazing into the window of a toy-shop, Gracefully, 56, extricating herself, she received the excuses of the 96 embarrassed Falstaff, with a 68 bland smile, and continued on her way. But hardly — 7 — had she reached the corner of the block ere she was overtaken by a 24 young man, 32 poorly dressed, but of an 85 expression of countenance, 91 hastily touching her 54 beautifully-rounded arm, he said, to her 67 surprise:

"'Madam, at the window of the toy-shop yonder you dropped this bracelet, which I had the 71 good fortune to observe, and now have the 94 happiness to hand to you.'

"(Of course, the expression '94 happiness' is merely the young man's polite hyperbole.)

"She thanked him, and with a 57 deep blush, and a 48 pensive air, she turned from him, and pursued, with a 33 slow step, her promenade."

"P. S. I regret to add that having just read this article to my wife, and asked her opinion thereon, she replied that 'if a first-rate magazine article was represented by 100, she should judge this to be about 13; or if the quintessence of stupidity were 100, she should take this to be in the neighborhood of 96.' This, as a criticism, is, perhaps, a little discouraging, but as an exemplification of the merits of my system it is exceedingly flattering. How could she, I should like to know, in ordinary language, have given so *exact* and truthful idea? how so forcibly expressed her opinion (which, of course, differs from mine on the subject)?

"As Dr. Samuel Johnson learnedly remarked to James Boswell, Laird of Auchinleck, on a certain occasion, 'Sir, the proof of the pudding is in the eating thereof.'"

The author of the above was Lieut. Geo. W. Derby, Corps of Topographical Engineers, U. S. A., and the article appears in his book "*Phœnixiana*," now, unfortunately, out of print, which contains much valuable and interesting information on a variety of subjects.

Respectfully yours, D. P. HEAP.

A WARNING TO EXHIBITORS AT THE PARIS *SALON*.

PARIS, October 22, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Permit me to bring to your notice an affair, of which a considerable number of architects having exposed in the Paris *Salon*, have for some years past been the victims.

The publishers of a monthly journal, known as the *Recueil d'Architecture*, which journal has, I believe, a more or less extensive circulation in the United States, have the custom of selecting among the divers works exposed at the *Salon*, and of obtaining the permission of their authors to publish the same in the above-mentioned journal, with the assurance that the original shall be restored to the owners in a few days.

The recompense generally offered is a single lithographic copy. My personal experience, which is only one of the many who have fallen into the trap, was that, after several fruitless demands for the restorations of my drawings, I was obliged to resort to legal proceedings in order to obtain them, which I finally did, some three months after the close of the *Salon*.

By way of recompense, I received a very insulting letter from the publishers, who, nevertheless, continue to publish the designs *under their own name*.

I hope you will kindly give this place in the columns of your journal, in order that any American who exposes in the Salon in future may be warned to protect himself against such knavery.

Very faithfully yours, JAMES ACKERMAN.
Architect.

NOTES AND CLIPPINGS

THE CATHEDRAL OF MALTA. — Of course, one of the chief attractions in Malta is the grand old Cathedral of St. John the Baptist, and I must confess that, as with other things of which we have heard high praise before seeing them, the first impression was disappointing. I entered St John's at the hour of vespers and felt chilled. There was a very small, inattentive congregation. Two men who sat close in front of me (poor tradesmen), were discussing their worldly affairs so audibly that an acolyte was sent down from the altar steps to silence them. The architecture seemed to me stiff and cold. It was not till I returned to Malta, on my homeward route, and had spent delightful weeks under the stone roof of the old Grand Masters, that, overshadowed by their spirit, I could realize something of the poetic beauty of their old cathedral and learn to tread with more reverence on that sacred pavement, because each stone is emblazoned with heraldic devices, or other memorial, of some brave warrior who knelt here at his devotions and now sleeps in the crypt below. But for this association, the pavement of Pietra Dura, in oblong compartments (in memory of divers knights), is very like a great piece of patchwork, and the effect of those inlaid marbles lack repose. All round the great church are side chapels, where the knights of each nation worshipped together. These, like their eight palaces, or, rather, *auberges*, were set apart for the knights of France, Provence, Auvergne, Arragon, Castile, Italy, Germany and Anglo-Bavaria. Each chapel, of course, has its great altar and crucifix,

before which some worshippers are always kneeling, heedless of passers-by. There are second-rate pictures and heavy monuments without number. Of these last, by far the most attractive to me is the beautiful statue of Comte Beaujolais, a name endeared to me by old family ties. The cathedral is said to have been formerly very wealthy, but the French stole great quantities of gold and silver plate and jewels from its treasury. Among other thefts was that of a most precious relic, namely, the right hand of St. John, which had been presented to the Grand Master by the Church of Santa Sophia, at Constantinople. A magnificent diamond ring was transferred by Napoleon from the skeleton hand to his own, and the relic was then restored to the Grand Master, who, being no longer able to give it honor due, sent it to Paul, Emperor of Russia, who built a church over it at St. Petersburg. Nothing escaped the rapacious invaders. — *N. Y. Times.*

The Cost of Cremation. — According to a report read at a recent session of the Berlin Cremation Society, the minimum cost of the incineration of a Berlin "subject" at Gotha amounts to 430 marks, exclusive of church fees, singing, bell-ringing, mourning-coaches and urn. An urn may be deposited, free of expense, in the columbarium for twenty years, at the expiration of which term its safe keeping is to be paid for, or the urn will be properly interred, unless otherwise disposed of by the relatives. If the incinerated remains are to be interred in a Gotha cemetery immediately after being cremated, such interment must be paid for like any other; they may, however, be taken away in a tin case by the family, if so desired. The quantity of coal required for an incineration, as included in the fore-mentioned specifications, is 2½ tons at 20 marks each; if several incinerations take place on the same day only 1½ tons are charged after the first.— *American Register.*

Wire and its Uses. — We directed attention some time since to the increasing importance of wire in various directions. One of the electrical engineers, in speaking to the same point, indulges in the following language: "In no part of economy are we divorced from wire. It is our slave, and an ever-present master. Sleeping, we repose on wire mattresses. Eating, we see food which has passed through sieves, and which is sheltered from insect appetite by wire covers. Calling, we pull wires to ring curled-wire gongs. Travelling, we are conveyed by cable or electric railways, hoisted by elevators hung on wires, and hurried over wire bridges. We announce our coming by telegraph or telephone wires, and we tread our way by night through streets lighted by means of electric cables. Across our fields are strung thousands of miles of barbed wire. Our clocks are set by wires, our watches run by wires, our books are stitched by wires, our pictures hung by wires, and our politics managed by wires. Forty years ago there was not a telegraph office in existence. To-day they number over 60,000. Ten years ago the telephone was not in existence. To-day there are 330,000 in use in the United States alone." — *Metal Worker.*

The Statue of Joseph Brant. — The statue of Joseph Brant (Thayendanegea), which was unveiled at Brantford, Ontario, on the 13th ult., is by Percy Wood. Brant stands erect, with his head turned toward the left shoulder, a tomahawk poised in one hand, as if he were alluding to it, and the other hand at his side, with fingers spread in gesture. He has an eagle feather in his hair and rings in his ears, a buckskin coat with broad sash, buckskin trousers and moccasins. A long cloak, fringed about the neck with bears' claws, hangs from his shoulders and rests on the pedestal. The latter is square and has two groups of three Indians each; those that stand reach to the level of Brant's feet. The statue was made from cannon granted for the purpose by the Canadian Government, and is nine feet high. The six flanking figures represent the Mohawk, Tuscarora, Oneida, Seneca, Onondaga, and Cayuga nations, typified respectively by a scalping knife, spear, pipe of peace, bow and arrows, club and flint-lock gun. The bear, wolf and tortoise, tokens of the chief clans, are also represented. On the two broad sides of the pedestal are trophies of Indian weapons and implements of the chase, while about the base are two large, bronze basreliefs, representing fifteen Indians in a dance and Brant addressing a meeting of chiefs. Of the $16,000 which this, the first monument undertaken in honor of an Indian, has cost, $5,000 came from the Six Nations, $5,000 from the Dominion, and $2,500 from the Provincial Government, the rest being added by individuals, the county of Brant, and the city of Brantford. — *Boston Transcript.*

Water-gas Fuel. — A large number of the various schemes for utilizing waste fuel in its different forms, to which prominence has been given within the last three or four years, have had in view the production or fuel-gas of some kind, principally water-gas, and it is to this latter, therefore, that special attention has been given. Even cursory examination, however, of the principals involved in some of these undertakings have demonstrated in a most conclusive manner that the requirements of water-gas manufacture are not generally so well understood as might be supposed, and the result has been that either those who had financial interests at stake suffered more or less heavily, or there was a collapse before opportunity had been given to the originators of such enterprises to successfully practise any great amount of deception. It may not be amiss, therefore, to briefly point out again, even in the absence of anything new or startling, some of the main features of the water-gas process. Water, as is well known, consists of hydrogen and oxygen combined in the proportion of two of the former to one of the latter. These gases have a great affinity for each other, and readily combine if, when mixed in the proper proportions, a light be applied to them. If, however, the mixture be highly heated throughout, no combination will take place. The precise point at which this result occurs, known as the temperature of dissociation, has not been certainly determined, though it is generally accepted as being between 3,000° and 4,000° Fahrenheit. There is reason to believe that the more highly the gases are heated below this point the less is the affinity which they have for each other. Thus, at a temperature of about 2,000° the affinity of oxygen for carbon is much greater than its affinity for hydrogen, and if, therefore, a current of steam be passed through a coal fire, the steam will be decomposed, the oxygen will go to the fuel, and the hydrogen will be set free, the result being a mixture of carbonic oxide and hydrogen, quite free, or nearly so, from nitrogen. The process is so simple and the economies ascribed, among other things, to the gain of hydrogen are apparently so great that the favor with which this method of gas manufacture has been received is not difficult to explain. Yet practically there are some drawbacks connected with it which make it appear in a less favorable light. The work done in dissociation cannot be performed without some loss of fuel beyond that theoretically necessary, and the hydrogen cannot be recombined or burned so as to give out its full effect, representing a waste of energy not to be overlooked. Convenience, however, is a point which may well be urged in favor of using some kind of fuel in the gas form, and to it there is reason to look as a cause of much development which may be recorded in this line of manufacture. — *Iron Age.*

TRADE SURVEYS

The latest summary of building-trade statistics in seven of the larger cities exhibit a rather surprising activity and a very gratifying outlook for the coming six months. The greatest general activity in building is exhibited throughout the West and Northwest. In the city of Chicago the value of permits for the first nine months of this year was $15,953,950 against $13,770,130 for 1885. The value of the permits of last week against the previous week's permits is nearly double. The building statistics of St. Louis exhibit a smaller increase, but at the same time a very gratifying one. In Kansas City, Omaha, Duluth, St. Paul and Minneapolis, the increase in permits and in their value certainly points to an active winter, and a more active spring. Building material of all kinds is very firm in prices and in numerous cases contracts have already been entered into for building supplies for the spring. There is also an encouraging degree of building activity in a number of manufacturing and business enterprises between the lakes and the Ohio Valley. Reports from Springfield, Joliet, Indianapolis, Columbus, Cincinnati, Toledo, Cleveland and from the manufacturing strip along Eastern Ohio, as well as from Wheeling, Pittsburgh and from Central Pennsylvania, all justify the general and safe conclusion that an extraordinary amount of preparation is being made for building for the coming season. A great deal of the activity will be in manufacturing. There is an urgent demand for more capacity, in iron and steel making, in glass-making, wagon and carriage making, tool and implement manufacturing, and, in fact, in all the industries connected directly or indirectly with iron and steel using. The building-trade conditions farther East are sufficiently familiar. The local building authority in New York city furnishes statistics showing that 3704 buildings have been planned in that city between January and October, costing $53,119,068, against 2874 buildings last year costing under $40,000,000. The total number of conveyances is put at 11,242 against 9,195 for same time last year. The corresponding amounts of money are $201,826,369 and $149,511,513. The number of mortgages recorded in New York city are stated by the same authority to be 10,150 as against 8,433 for same time last year, representing in round numbers $117,000,000 and $86,000,000 respectively. The building statistics of Philadelphia exhibit a similarly active condition in house-building, manufacturing, and shop-building, and in real-estate transfers. Real estate throughout Pennsylvania has been in active demand, and authorities there state that the sale of lots for building purposes to people able and intending to build has been far in excess this year of any previous year. The same activity is found to exist in Western Pennsylvania. A great deal of manufacturing capacity is seeking sites there, attracted by the economical advantages of natural gas. A vast amount of house-building is projected by local capitalists for the coming year. Rolling-mill capacity is being increased. New mills and furnaces are either projected or under way. The entire natural-gas region will, it is evident, become the greatest manufacturing centre upon this continent. Through Ohio, especially within reach of the natural-gas region, there is a great deal of new building projected. The Ohio Valley is maintaining its prestige as a manufacturing region, but the greater part of the new enterprises are small concerns involving an expenditure of $5,000 to $100,000. It is probable that there will be no serious advance in iron and steel or in their products. While trouble is probable in the building trade it is scarcely possible in the iron trade. The two classes of mill-labor are controlled by yearly contracts, one which expires in January and one in June. All kinds of iron and steel are high and firm in price, but prices are not likely to be jeopardized by any speculative influences.

The distribution of all kinds of lumber has been remarkable. Mills in the Northwest are, in numerous cases, operated day and night to accumulate stocks sufficient to meet the requirements which the development of the past two months have shown to be necessary. Freights have been advanced both by lake, rail and coastwise. Dealers have advanced quotations correspondingly, and buyers are still making haste to cover winter requirements. No scarcity is probable. Saw-mill capacity in the Northwest and South has been largely increased and presumably, therefore, the future supplies will be greater. Lumber manufacturers have been hopeful all along that the cut now nearly over would not crowd the market. It is only the extraordinary demand which keeps prices at anything like remunerative limits. The industrial situation generally is strong. Fuel is in active demand, shop-capacity is oversold, capitalists feel more inclined to extend their investments in industrial directions, and in view of the general activity and strengthening of prices. The wonderful expansion going on North and South will meet the extremest requirements of the country. Foreign and steel markets are improving, and large orders are now in hand for rails, blooms, billets, crude iron and other products. The American rail-makers have sold one-third of their producing capacity of next year, and the car and bridge builders are hurrying in orders. Both at home and abroad the industrial revival is significant. The activity abroad means higher prices here next year.

The labor question continues to occasion distrust. Employing interests desire a settlement of wages during the winter, yet they do not feel inclined to ask their employés to meet them for that purpose. Organization among employers is growing in many industries. The compacts made have been maintained and are restoring confidence. The unfortunate eight-hour strike at Chicago revives distrust as to the probable future course of the Knights of Labor, but employers generally have faith that so far as that organization is concerned there will be no official recognition or aid given to a general movement to that end.